SCIENTIFIC AMERICAN

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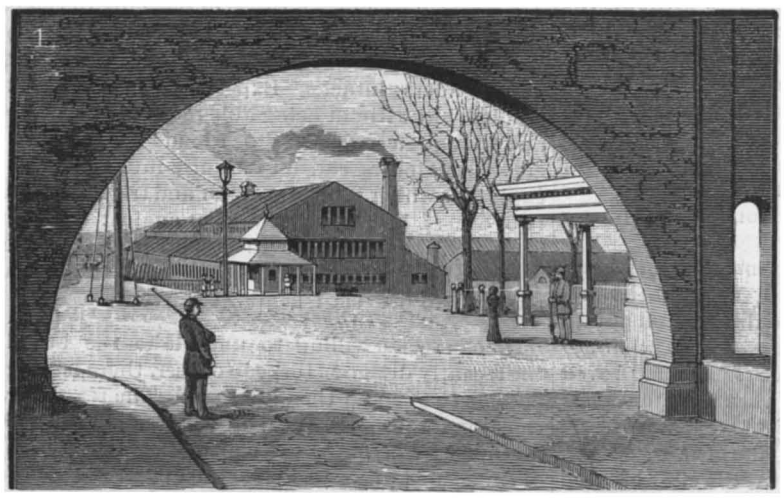
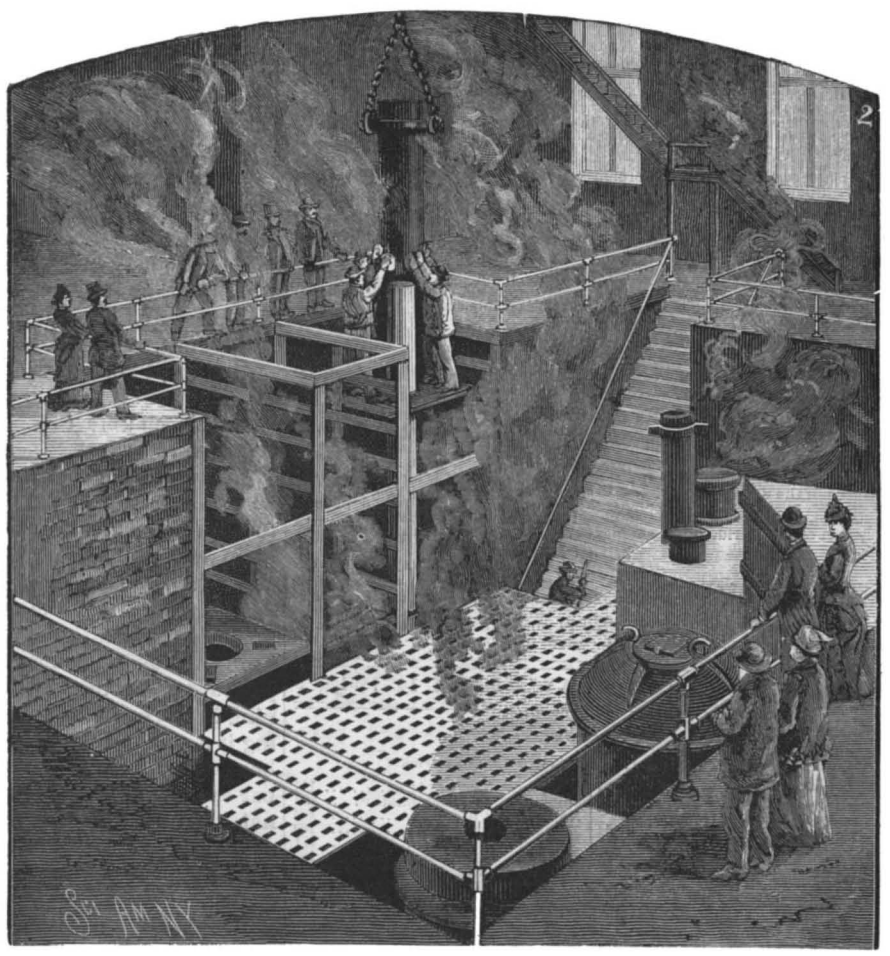




MANUFACTURE OF HEAVY GUNS FOR U. S. NAVY.

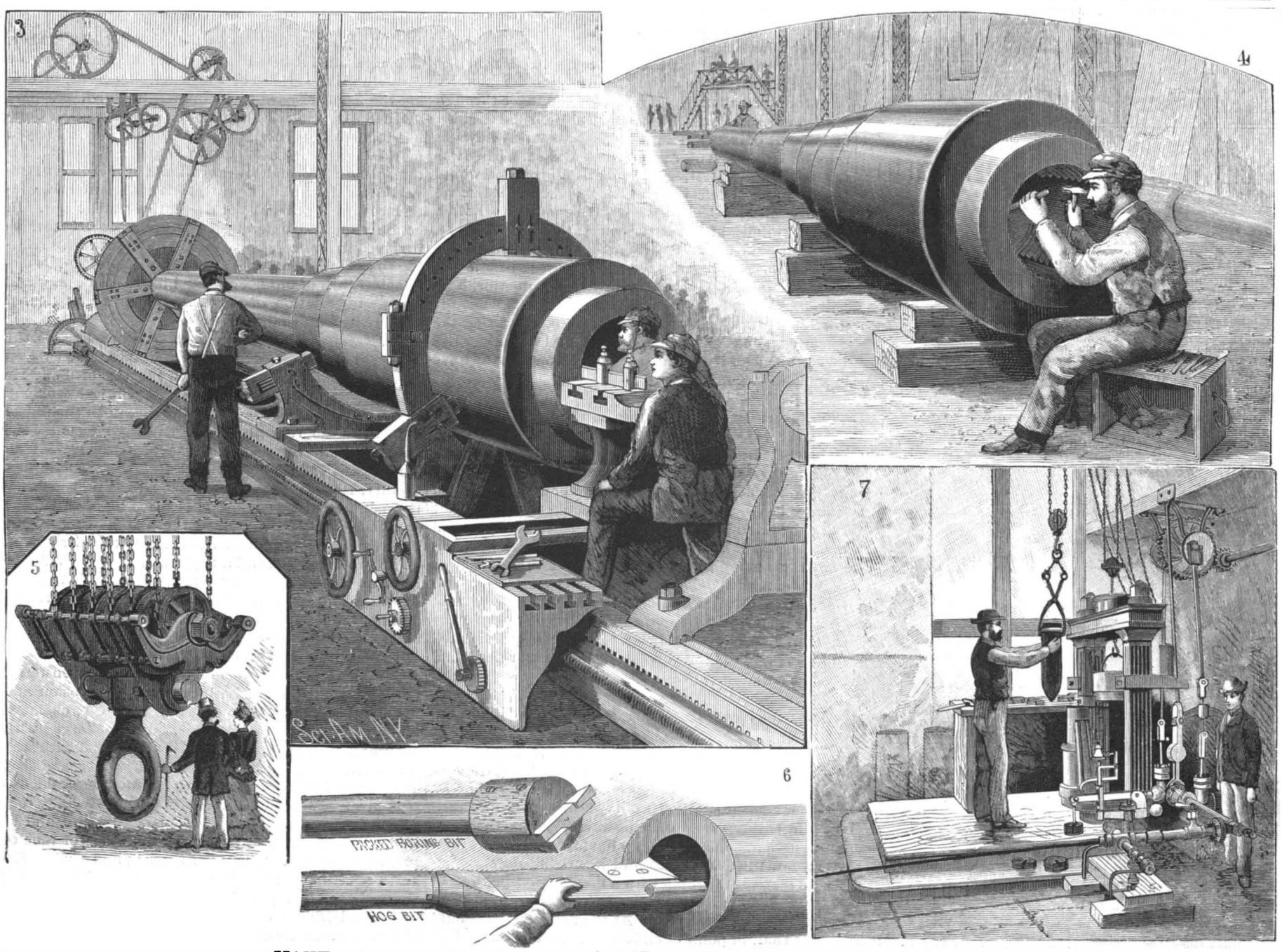
(*Continued from Scientific American, February* 28, 1891.)

Before entering upon a description of the assembling and finishing, let us consider the method followed to discover the physical characteristics of the steel. Those to which particular attention is given are tensile strength, elastic limit, elongation, and contraction of area.

From each forging several pieces are cut transversely to the axis of the bore of the finished gun, and of sufficient dimensions to be machined to cylindrical specimens 2 inches long between measuring points and ½ inch diameter. These are called test pieces, or test specimens, and have screwed heads at each end to fit the holders of the testing machine. They are stretched and broken, and their physical condition carefully observed and recorded.

The present requirements of the United States navy approximate those of the table on page 166.

(*Continued on page* 166.)



MANUFACTURE OF HEAVY ORDNANCE AT THE WASHINGTON NAVY YARD.

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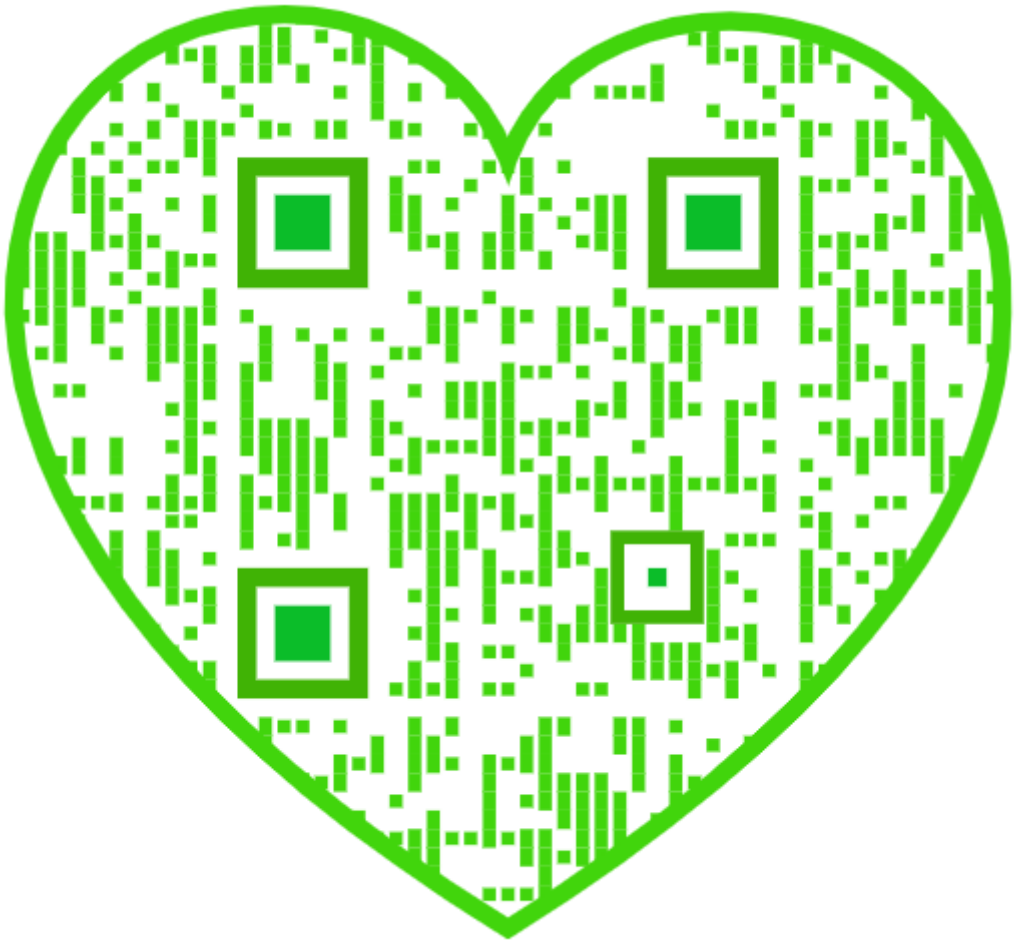

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INDOOR EXERCISE.

What are the best forms of indoor physical exercise? A careful observer in the gymnasia of the athletic clubs and in the private institutions will scarcely help reaching the conclusion that many young men get more harm than benefit, either because of an injudicious selection of their mode of work or by reason of carrying it beyond a reasonable limit. Lifting heavy bells is almost a mania with a large glass of amateurs, though one might search the town in vain to discover a single case of a professional acrobat using a bell of more than one or two pounds weight. Another large class add to bell lifting various other labors of an exhausting nature; heavy work, as it is called, designed to abnormally develop the arm and chest muscles without the adjunct of running and jumping and bar work, which adds so greatly the wanted elasticity. The effect of this heavy work on the vital organs, especially in the case of those not used or bred to violent exercise, is noticeably injurious. Some lose their color and become sallow of visage, some grow pale and take on a tired, overworked expression, while not a few get sprains which force them to lie off for longer or shorter periods.

The case may be cited of a young man of slim figure, who, by long-continued work with heavy bells in a large and well known gymasium, could curl and put up 180 pounds. Suddenly he was attacked with what appeared to be rheumatism, but which, later on, proved so serious an injury to the spine that for months he has not been able to do any physical work, and there is reason to believe is permanently disabled.

A curious fact in connection with the class of men who do heavy lifting is that their great muscles seem to be of no service to them except in lifting. Few of them are quick enough to excel in boxing—for of what use is a heavy blow if not quick enough to hit its mark?—and they seem to have little endurance; being unable to bear fatigue, as though the heart and lungs were enfeebled. A man who has had thirty years' experience observing lads and men training declares running in the open air to be the best of all exercises, making it a rule to recommend "all around" work, such as boxing, hand ball, jumping, and single and parallel bar exercise; these, to his mind, being adapted to most naturally develop the body as a whole, and normally develop the exterior muscles, while at the same time benefiting the vital organs.

Miscellaneous Notes.

Railroad men, especially, will regret that the schiseophone, an electrical instrument invented by a Frenchman for detecting flaws in metal castings and forgings, is not realizing the promises made for it. For in the newer railroad science, though study and ingenuity have found means of greatly lessening danger through broken axles and wheels, through collision and the like, no amount of inspection has sufficed to detect flaws in rails and to prevent rail splitting. Hammering was the only known test, a fairly accurate one, it would seem, when the defect was of an exaggerated description, the human ear being sensitive enough to note a certain dullness in the sound which the hammer gave, but it long since became evident that flaws could exist and the blow of the hammer give no recognizable signal. The schiseophone could unerringly do this, had, indeed, accomplished it repeatedly. That is what the first reports of the instrument declared, indicating the defective point, and being corroborated when the rail was broken and examined. This seems now to have been an exaggeration.

The overhead trolley system of electrical traction is not, so it would seem from report, by any means satisfactory; at least, in its present stage of development. Complaints come from many quarters that it is insufficient and uncertain. Much snow or rain and much leakage have come to be synonymous terms in street railway parlance, and there is another class of physical phenomena, not yet understood, which so seriously impairs the driving power of the motor as to call for large parcels of additional energy from the generating station. Where this is not forthcoming, outside aid must be had to prevent interruption of service; one of the Cleveland, O., electric railways being recently compelled to hire horses to haul their cars on grade till normal conditions again prevailed.

Up to the recent launching of the British battle ship Royal Sovereign, the Italians had possessed the largest war ships, the Italia and her mates, each being credited with a displacement of 13,900 gross tons. The latest addition to the British line has a displacement estimated at 14,150 tons, thus slightly outweighing the rival craft. A radical difference exists, however, in the theory of construction, the British ship having a protective belt of armor, with steel face and iron back on the compound system, the same with a maximum thickness of 18 inches, while the big craft of the Italian fleet have not any outside protection. At the first blush, it would appear that, in point of endurance, the odds would be largely with the British ship, but first-class naval authorities are not by any means agreed that side armor is efficacious, for since even the six-inch rifle at short range can pierce the heaviest armor that can be floated, there is a likelihood that shells will break through and explode, unshipping the guns and demoralizing the crew, while in the case of unprotected sides it is likely to cut its way clear through the ship and explode harmlessly in the water.

Notwithstanding the many years the steam boiler has been under observation, there are conditions of steam making which play strange tricks, as indicated by the steam gauge, the pressure, without any discoverable cause, at times increasing 40 or 50 degrees in as many seconds, and not infrequently leading to disaster. In a big electrical lighting station in Philadelphia there has recently occurred a series of mishaps to the boilers extending over a period of twelve or fourteen months, the strongest bolts being inadequate to keep the bends and headers intact. Experts have examined and studied, but without being able to agree upon the cause, and though a coroner's jury, made up of boiler makers and engineers, called to inquire into the cause of an explosion which killed one man and frightfully scalded two others, brought in a verdict against the electrical company, it was unable to explain wherein there had been want of precaution or point out the safeguards required to prevent a similar occurrence.

No one seems willing to undertake the building of the recently designed torpedo chaser, there having been no bids to open on the date fixed. The reason given is that the limit of cost fixed by Congress, to wit, $350,000, is wholly inadequate, the contract calling for engines of sufficient power to drive the craft 920 knots (about 1,060 statute miles) in 40 hours. To average 23 knots for so long a stretch would require a still higher speed at times to make up for that falling off which almost invariably occurs during the ordinary conditions of ocean steaming. It is encouraging, however, to learn that the tubulous boiler men do not regard the task as impossible or impracticable, or even as exceeding the powers of American mechanics, hesitating to accept it only because the promise of reward for successful accomplishment is not, to their thinking, commensurable with the chance of failure.

Changes at the Patent Office.

Robert J. Fisher has resigned the position of Assistant Commissioner of Patents to accept an appointment tendered to him as general counsel of the Eastern Railroad Association. He was born in York, Pa., is forty-three years of age, of Quaker descent. Mr. Fisher is a graduate of Pennsylvania College and the Albany Law School. He entered the Patent Office in December, 1875, as a third assistant examiner, and gradually rose through all the grades of the examining corps, including the Appeal Board of Examiners-in-Chief.

Mr. Fisher entered upon the duties of Assistant Commissioner of Patents April 5, 1889, and has displayed marked executive ability in the performance of his difficult duties, and by his dignified, courteous, impartial service in his judicial work has secured the confidence and high regard of the entire patent bar. In considering and determining the numerous questions involved in and constantly arising under the law relating to patents he was peculiarly well adapted. His mechanical turn of mind enabled him to see clearly and readily the relation of parts in the most complicated and intricate machinery.

Mr. Nathaniel L. Frothingham, of Massachusetts, the successor of Mr. Fisher, was born in 1856. He entered Harvard at fifteen, graduating in the class of 1875. He attended lectures in Roman law and political economy at the University of Leipsic, Germany, until the fall of 1877, when he returned to this country to enter the Harvard Law School, finishing his course there in three years. He was admitted to the bar of Suffolk County, Mass., and was actively engaged in the practice of law until June 15, 1889, when he accepted the appointment of law clerk of the Patent Office. Mr. Frothingham is a grandson of the eminent clergyman, N. L. Frothingham, and a nephew of Rev. O. B. Frothingham. The President sent the nomination of Mr. Frothingham to the Senate on the 28th of February, and he was confirmed the same day.

Ammonia Water as a Fire Extinguisher.

Considerable alarm was occasioned at Queensferry, near Hawarden, recently, by a serious explosion and fire at the works of Messrs. J. Turner & Co., chemical manufacturers and tar distillers. A still charged with anthracene oil, 10 tons in quantity, exploded with terrific force, owing to the choking of the worm, and shot a volume of flame skyward that illuminated the district over a wide area, and was visible 10 miles off. The burning oil scattered itself over the yard and to the pitch house adjoining, where hundreds of tons of pitch were stored. The pitch ignited, and the conflagration assumed alarming proportions. Luckily, all the day men had just left the works, but three who had been left were burned. The Sandycroft Fire Brigade was promptly on the spot, and, by using ammonia water from a 50,000 gallon tank, they subdued the fire in an hour and a half.—*Journal of Gas Lighting.*

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POISON OF SNAKES.

BY NICOLAS PIKE.

Death comes inevitably to all, and in a thousand varied forms, but outside of hydrophobia, death by the bite of a rattlesnake or other poisonous serpent is surely one of the most horrible. No wonder a venomous snake inspires such dread, as it is rarely the wounds are cured unless tended at once, before the venom has time to spread. Scarcely a week passes without accounts of snake bites that often end fatally. I feel so much interest in the subject that I have for years carefully noted whatever I could find relative to it, and as some of the remedies I have procured have been successful, on the best authority, I give them to the public in hopes they may help some sufferer who is in the neighborhood of such venomous reptiles. Fortunately, North, we have only the rattlesnake and copperhead, and they, in my opinion, are two too many, and I trust some of the simple remedies may help where the victim is far from medical aid.

Rattlesnake bites, if not fatal, are always serious, especially in hot weather. It is said that ammonia is not the antidote it has long been represented. All the same, it is a good thing to have handy some strong spirits of ammonia, to be used internally and externally when no other remedy is available, not forgetting to tie a ligature very tightly (or it is useless), above and below the wound, to stop the spread of the poison in the veins. The following recipe I received in a letter from Mr. J. D. Legg, of Long Eddy, N. Y., and I think it invaluable, as it is within the reach of most people in the country.

This gentleman wrote me: "This remedy was obtained by one of the first settlers in this section, from a half-breed Delaware Indian, nearly 100 years ago, and has been successfully used by those knowing it ever since. In no case has there been a failure in man or beast. I have known of it for 30 years, and am personally acquainted with six individuals bitten by rattlesnakes and cured by this remedy. Apply immediately to the wound a poultice of indigo (or common washing blue) and salt, in equal parts, mixed with cold water, and renew every two or three hours. Eat freely and also drink a tea of the leaves of the common blue violet (*Viola saggittata*), which may be distinguished from other species by chewing the leaves for a moment, the taste being like slippery elm* bark. The violet leaves should also be placed round the member bitten, between the wound and the heart, far enough from the bite to be just beyond the swelling, making a compact ring, covering the flesh completely in its course. As the leaves become dry from the fever engendered by the poison, they should be dampened with cold water, and be replaced by new ones from two to three times a day, taking care to keep them just beyond yet close to the swelling. Their effect seems to be both inwardly and outwardly to thoroughly counteract the poison. This is all that is essential to the cure."

Two years ago I was informed for the first time of a sure cure for the bite of a copperhead, so much more to be dreaded than the rattlesnake, as it gives no warning to the intruder, but strikes unawares. This remedy is so simple it would seem almost absurd, did we not know that our Indians and the natives of most other countries find their surest relief from the various ills they are subject to in simples provided by nature close to their doors. I confess, from the ill success attending much of the treatment for snake bites in hospitals, and by the doctors generally, I am inclined to have more faith in the simple remedies. I was told of a young lady who was seeking for wild flowers in the woods at South Salem, Westchester County, N. Y., and was bitten on the foot by a copperhead, or chunk head snake, as it is called in that neighborhood. The snake was killed, and one of the party, a Mr. Judson, sliced an onion and applied it to the wound, and it was cured.

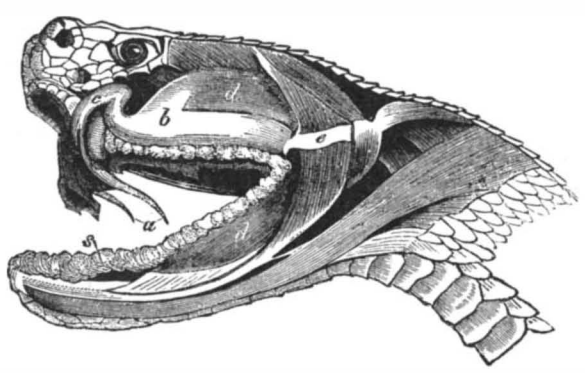
On hearing the story, I resolved to get further information from headquarters, as it certainly ought to be made known if a remedy so accessible to every one is thus efficacious. I wrote to Mr. O. Judson, who is a farmer in that vicinity, to ask if the cure I had heard of was really effected by an onion, and he answered as follows:

"In regard to the *snake business* onion, if applied immediately it will draw out the poison, and it is about as easily cured as a bee sting, and should be treated about the same, only with more promptness. Cut the onion in two, crosswise (not lengthwise), hold a part of the onion on the wound for five minutes, when it will turn green, remove it and apply the other half and let it remain on about the same time. It will take two or three onions to effect a cure. If the person has been bitten say half or three-quarters of an hour, you must apply nitrate of silver to the wound and take plenty of whisky inwardly."

Mr. Judson vouches so assuredly of the certainty of the onion cure from his own experience that whenever he sees a party going into the woods where these snakes abound, he asks if they have any onions with them. Surely it is worth while for collectors of deadly reptiles to take a few of these common roots along, as I do not see why they should not also cure the bites of other reptiles and poisonous insects.

At Pernambuco and all through Paraguay an equally simple application is used, they tell me, with certain success. A solution is prepared of two or three grains of permanganate of potash, and a subcutaneous injection made above and below the bite. This remedy was given me by a gentleman who has traveled much in South America collecting insects, and he said they never went out into the field without it, and it rendered him quite fearless of accidents.

In the Cape of Good Hope, South Africa, where there are so many deadly serpents, many people are bitten every year, often fatally. *Cobra capellos* and *puff adders* are two of the commonest snakes all over the colony. A clegyman, who resided where the hideous *puff adders* swarm, had been very successful among his people in his treatment of their bites, and for the



benefit of the whole colony he published his recipe. He writes:

"The following is the best mode of using this invaluable antidote: Mix a teaspoonful of ipecacuanha powder with a little cold water, then scarify the part bitten, making two or three cuts through the skin, and apply the same as a poultice. This should be followed by about thirty grains in a wineglassful of cold water as an emetic, and if necessary, both may be repeated in half an hour. This is seldom required to complete the cure, as the pain generally ceases in less than that time, and appetite and health speedily follow."

It would be too long here to give cases of some remarkable cures he made, and it has been successfully tried in India. To speak of the snakes and their bites in the East Indies would require a volume. So I leave them out. Most of the African tribes, as well as our North American Indians, use nicotine for serpent wounds.

In some of the fine agricultural districts of South Africa, the wheat fields abound with puff adders. Formerly, when engaging the reapers—mostly Hottentots—they would rarely consent to begin work without a "snake doctor" to accompany them to the fields. All Hottentots are great smokers, but the "doctor" de-

ARROW-LEAVED OR SNAKE VIOLET.

Viola sagittata L.

lights in short black pipes, never cleaned, and so impregnated with nicotine no white man could use them. He generally amuses himself hunting the reptiles for a while, then smokes and takes a nap till wanted.

Should a reaper be bitten, the old fellow rouses up at once, as he knows quick work is everything in a snake bite, and his reputation is at stake, too. He applies a ligature above and below the wound, if possible, tightening to strangulation of the parts, a drop of nicotine is extracted from his pipe, and after well scarifying the wound, it is rubbed in. Another drop is diluted and put in the patient's mouth, followed by continuous draughts of fiery "brandwein" or Cape brandy, when he is carried home, and according to the constitution of the man is the length of time he takes to recover.

Even after a cure is effected serious results manifest themselves from puff adder bites, when the victim has to all appearance completely recovered.

A gentleman I know was bitten in the left arm, but seemed to be all right soon after. Yet, in a year, he quite lost the use of his left eye. A Tambookie girl, who was bitten on the leg, suffered badly, but was apparently cured. For years after, on the recurrence of the hot season, when she was bitten, her leg swelled up to the hip and she was in dreadful agony for over a week. I could cite many other cases were it necessary.

I have received from my friend, Dr. J. H. Garnier, the learned naturalist, of Ontario, Canada, some most interesting notes on snake poisoning. This gentleman received a number of the deadliest snakes of India, and, by accident, the vessel containing them was broken and all the liquor spilled. He placed them in fresh alcohol to soften them, as they were all dried up. After soaking them for some time, he spent hours examining their heads and fangs. Early one morning he had received a slight abrasion on the third finger close to the nail and some trivial scratches, so slight he had scarcely noticed them. When they were first immersed in the alcohol they smarted, but that passed off, and, when he had finished his scrutiny of the heads, he went to visit a patient in the country.

On returning, about 6 p. m., he felt a strange numbness in the fingers and right arm, followed by dizziness, and felt squeamish at the stomach. Being, as far as he knew, in perfect health, he was puzzled, and soon became sick and faint. On questioning himself seriously as to the cause, he bethought himself of his morning's work, and felt sure he was under the influence of poison. Feeling himself getting sleepy and stupid, and not wishing to frighten his family, he went into his surgery and mixed a drachm of iodide of potash in two ounces of cinnamon water, which he drank, and repeated the dose in ten minutes. He then swallowed several glasses of brandy and began to feel relief. When he thought the iodide was well absorbed into the system, he took an ounce of sweet spirits of niter in cinnamon water. He followed this up by whisky, and went to bed, perspiration set in, and though the arm continued numb, the pain decreased. The next morning he was better, but the numbness remained for several days.

This accident set the doctor's busy mind thinking, and he experimented on some dogs with fresh poison from the fangs to try if the iodide of potash would neutralize the venom of a rattlesnake. He was very successful, and then he wrote out a formula for the treatment of snake bites, and gave it to a friend of his, also a doctor.

Very soon after, two very serious cases of men struck by rattlesnakes were brought to him, and a valuable dog was also bitten. He not only cured them from the doctor's remedy, but prevented the after consequences, often so troublesome under ordinary treatment, and a note of each case was carefully written out for Dr. Garnier.

In all the cases some time had elapsed after the bite, as the victims had to go from a distance to the doctor's residence. At once a drachm and a half of iodide of potash was given, and in ten minutes half an ounce of sweet spirits of niter, followed by 3 ounces of brandy. This was repeated at intervals of twenty minutes for about an hour and a half, when the patients were greatly relieved. This treatment was followed by a preparation, viz.:

Iodide of potash	4 drachms.
Fluid extract of sarsaparilla	2 ounces.
Water enough to make an 8 ounce mixture.	

To be taken one teaspoonful in water three or four times a day, and all the patients recovered quickly. The same remedy was applied by Dr. Garnier to a man badly stung in the face and head by wasps from a disturbed nest.

The above remedy is so simple and easy of application, and so well tested, Dr. Garnier intends sending it in pamphlet form to be used in countries where poisonous snakes abound, and courteously gave me the benefit of his notes. I trust some doctor who reads these lines will be induced to try the above, as I feel sure it will save many a life that would be lost by inefficient treatment, or ignorance, and I am glad to give it publicity in a journal that will spread it far and wide for the benefit of humanity at large.

PROFESSOR ELIHU THOMSON delivered a very interesting address upon "The Thunderstorm from the Standpoint of Modern Science" before a large audience at Town Hall, Swampscott, Mass., recently. The lecture was illustrated by experiments that were made successful in spite of the dampness of the evening, by the ingenuity of the lecturer. He produced most of the effects of thunder, lightning, brush discharges and the aurora borealis, and spoke at some length on the researches recently made by Professor Crookes, of England, on the effects of discharges in vacuo. According to the *Electrical World*, the lecture was enjoyed very much by the audience, the more so as it was the first appearance of Professor Thomson before his townspeople.

* *Ulmus fulva*, the red or slippery elm.

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A WINDOW CLEANING BRUSH.

A brush with which the upper as well as the lower sashes of windows may be readily cleaned, and with which the outer faces of the panes may be as easily cleaned as the inner faces, is shown in the accompanying illustration, and has been patented by Mrs. Mary L. W. Martinot. The handle of the brush is made in

MARTINOT'S WINDOW CLEANING BRUSH.

two or more sections, one section screwing into another to lengthen the handle. The end of the handle thus formed is screwed into a threaded aperture in one end of a horizontal plate, and into the other end of the plate is screwed a pole, also constructed of a series of sections screwed together. The sections of the pole and brush handle are preferably made tubular, so that the parts may be as light as possible.

For further information relative to this invention, address Mrs. Mary White, No. 1541 Broadway, New York City.

BOILER FLUE FLANGING MACHINE.

We illustrate a powerful boiler flue flanging machine constructed by Messrs. George Booth & Co., of the Central Iron Works, Halifax, for the works of Messrs. Denny & Co., engineers and boiler makers, Dumbarton. The machine says *Engineering* is capable of dealing with flues of from 1 ft. 10 in. to 4 ft. 6 in. in diameter and from 1 ft. 6 in. to 4 ft. 6 in. long, and up to ⅝ in. thick. The flue to be flanged is placed on the large horizontal chuck, where it is held by four gripping jaws while its upper edge is being flanged. During the process the top of the flue is supported by two anti-friction rollers, which can be adjusted for any size of flue by the handle shown to the right of the machine. The actual flanging is done by another roller kept up to its work by the sector and worm gear shown, which is driven by power, thus permitting of rapid manipulation of the machine. The chuck is rotated by powerful gearing driven by belting in the usual way. The largest flues can be flanged to a depth of 4½ in. at one heat, the time required to complete such a flange being about one minute. The handles principally used in working the machine are grouped together at one end within easy reach of the attendant. The machine has been specially designed for making flues built up in short lengths, connected together by Adamson flanged joints, the elasticity of which allows free expansion of the flue longitudinally, and at the same time adds considerably to its strength.

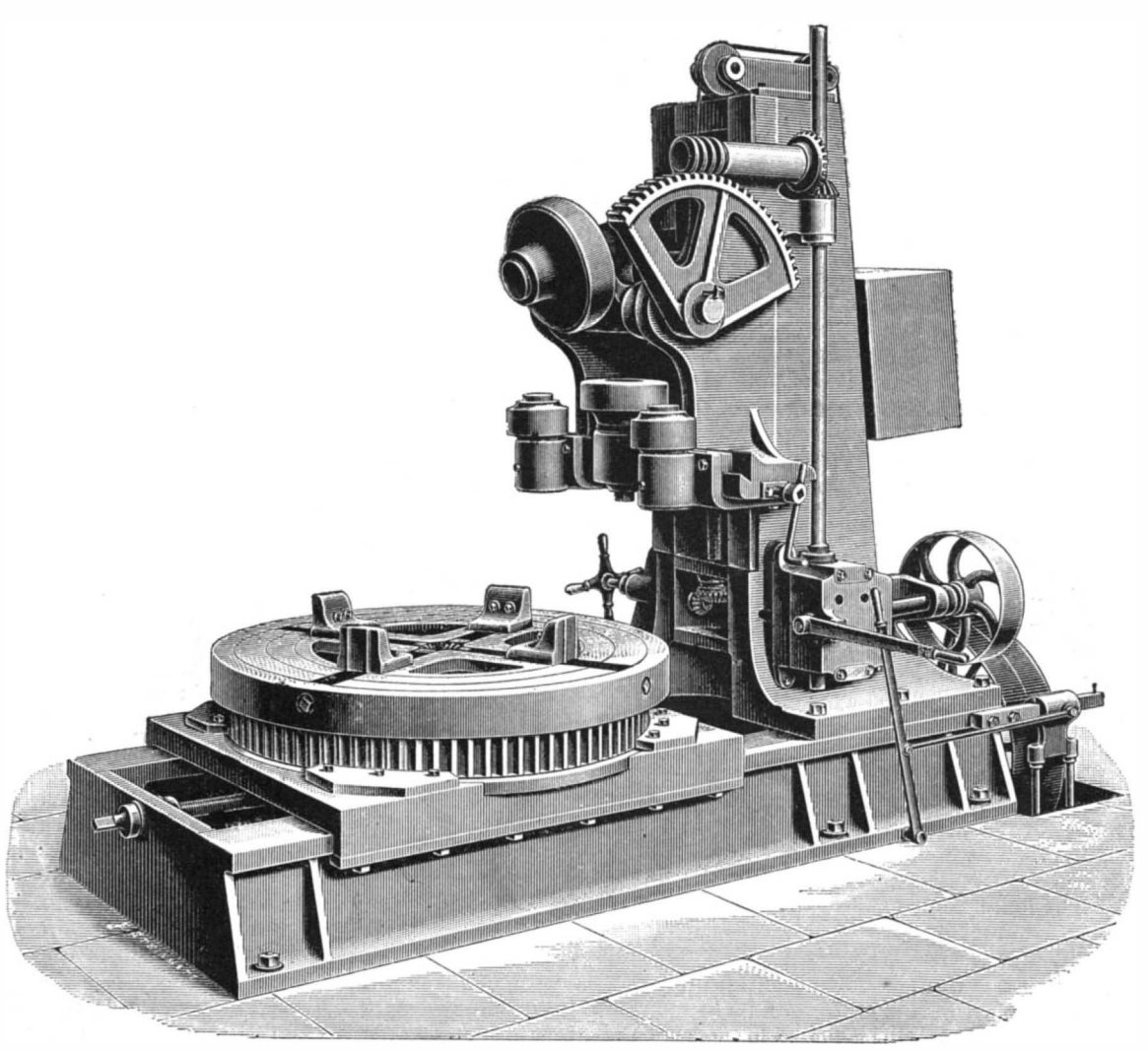


PLATE FLANGING MACHINE FOR MARINE BOILER WORK.

IT is claimed that the fastest time ever made on an American railway was on the Pittsburg, Fort Wayne, and Chicago road. The official report showed that a train ran 53 miles in 45 minutes, 11 miles of which were covered in 7 minutes, or at an average speed of 94 miles an hour. This record is said to be authenticated by the train sheets.

How to Print Photographs in Ink.

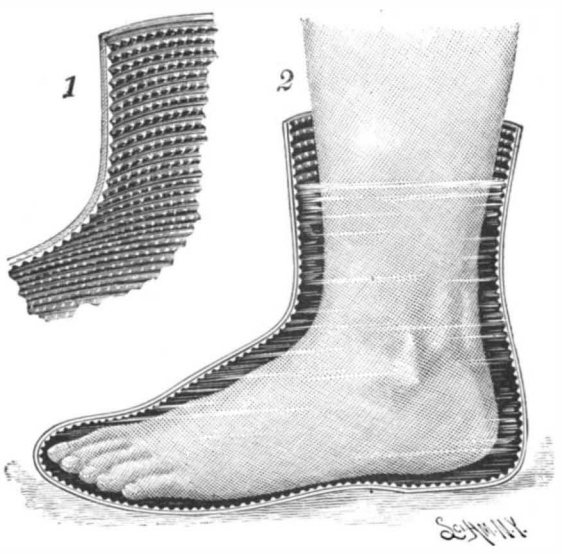
At a recent meeting of the London and Provincial Photographic Association, a demonstration was given by Mr. L. Warnerke on "Collography." The lecturer expressed his opinion that a wide future is open for photo-mechanical printing. There was a general belief that special appliances were necessary, and that generally all processes of this kind were troublesome to work. The demand for cheapness and quickness of production had proved detrimental to good work. The process he intended to demonstrate was simple, requiring no special apparatus of any kind, enabling amateurs to produce quickly an unlimited number of copies on ordinary paper, with printer's ink, from photographic negatives. For the purposes of demonstration the lecturer had brought with him several sheets of exposed films in various stages. He proceeded to describe the process. A sheet of vegetable parchment, having a film of gelatine on its surface, is immersed for three minutes in a bath of bichromate of potash neutralized with ammonia. The sheet is then squeegeed to a glass plate that has previously been cleaned and polished with French chalk. The plate is now left to dry spontaneously. The drying should be completed in about ten hours, when the film will peel off its support. The maximum of sensitiveness would be reached in from two to three days after sensitizing. The object of drying the sheets on glass is to produce a flat surface, thus giving perfectly even contact with the negative. The sensitized film is exposed in an ordinary printing frame. When sufficiently exposed, the image will be quite visible. An exposure of the back of the film for two or three minutes to diffused light will cement it to the parchment support. The exposed tissue is now placed in water and allowed to remain about two hours until quite colorless; it is then drained and blotted, and the following solution poured over it:

Glycerine	70 parts.
Ammonia	3 "
Water	30 "

After soaking for an hour, the tissue is stretched upon a frame over a block of wood, and rolled up with printer's ink. For this purpose, the lecturer recommended using first a stiff ink, and afterward a thinner kind. Authorities differed with regard to the materials for thinning the ink. The lecturer said he preferred lard for this purpose. Sufficient rolling having been given to the surface of swelled gelatine, a sheet of paper is placed on it, and an impression can be taken in an ordinary letter copying press. Mr. L. Warnerke, at the conclusion of the demonstration, pulled several proofs from a sheet of prepared tissue, and passed them round. In answer to several questions Mr. Warnerke said he was unable to state the limit of the number of impressions that could be taken from one sheet; he had taken as many as 300 himself. Any paper might be used. It was necessary in printing to lay strips of paper round the inked image to protect the sides of the sheet of paper receiving the impression.

A FOOT BATH DEVICE.

The illustration represents an exceedingly simple form of foot bath receptacle, designed in use to facilitate the removal of callous skin and promote the action of the bath upon the entire foot and ankle. It is a patented invention of Mrs. Mary L. W. Martinot, of New York City. A receptacle is employed for each foot, made somewhat larger than the ordinary boot or



MARTINOT'S FOOT BATH.

shoe, and preferably of rubber, but with the entire inner surface roughened, as shown in Fig. 1, or in any approved manner. The leg section may be provided with a strap, draw string or equivalent device, to hold the bath receptacle in position, and enable the bather to walk about while using it. The receptacle being supplied with water prepared as desired for the bath, the natural movement of the foot therein is designed to cause a most effective and beneficial frictional contact, with the minimum of exertion.

For further information relative to this invention, address Mrs. Mary White, No. 1541 Broadway, New York City.

The Use of Aluminum in Iron Foundries.

Mr. David Spence, in *American Machinist*, says:

During the past winter I have used aluminum in foundry practice, and find that it is a splendid thing to make iron fluid and clean. It seems to take all the impurities out of the iron when it is charged in the cupola with the pig iron. Ten pounds of Cowles' ferro-aluminum to 2,000 pounds of pig iron will produce good, sound castings, free from blow holes.

It is as good in the use of crucible steel as in iron (its effects). It produces a sharp and solid casting, makes a uniform grain. It takes away the tendency to chill in cast iron.

In steel it reduces the shrinkage, and increases the welding properties in both wrought iron and steel.

I recommend it to persons making tool castings, such as face plates, and in fact all kinds of work that has to be planed, milled, or turned.

There is one thing that I like in its use, and that is, it does not weaken the iron or take the strength from it, but rather adds to it. We are having good success with it in sewing machine castings. I believe in progress in foundry practice, and am always willing to give such things a trial, if I find that they are a benefit.

I want other foundrymen to know it. I believe we are making rapid progress in American foundry practice, and the foundryman that is satisfied to run his foundry in the same old-fashioned way his grandfather did, he is going to get left. And the younger and more progressive men will come to the front.

AN olive oil factory is soon to be built in Sonoma County, California, by a company which now has sixty acres of six-year-old olive trees and is planting 700 acres more. The plant will cost $250,000.

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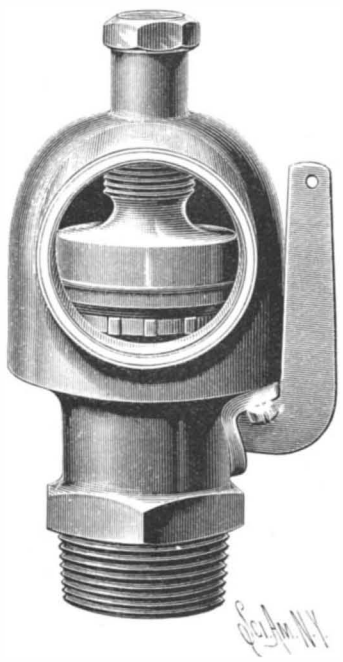
AN IMPROVED SAFETY VALVE.

The illustration represents a safety valve adapted for use on locomotives and steam engines generally, the device being of such construction that it cannot readily be tampered with without such interference being noticed by the engineer or other person in charge. It is a patented invention of Mr. E. B. Kunkle, of Fort Wayne, Ind. On the top of the valve body is screwed a semi-spherical cap having an outlet to be connected with a pipe for carrying off the steam, the top portion of the valve being partly seen through this opening. The valve is substantially cup-shaped, with a double flange around its top edge, and is vertically guided by a series of ribs on the inside of the valve body, the valve seat being opposite the opening. Within the valve is a central bottom depression engaged by a point on the under side of a disk on which rests a coil spring, the upper end of the spring supporting a disk having in its top face a depression engaged by the pointed lower end of a regulating screw. To prevent steam or water from passing to the spring, a disk with a hub screws on the regulating screw, the disk having a downwardly extending annular flange which engages the outer edge of the flange at the top of the valve, while the hub screws into the semicircular top, the hub being also enlarged at its upper end to receive a locking nut screwing on the upper end of the regulating screw.

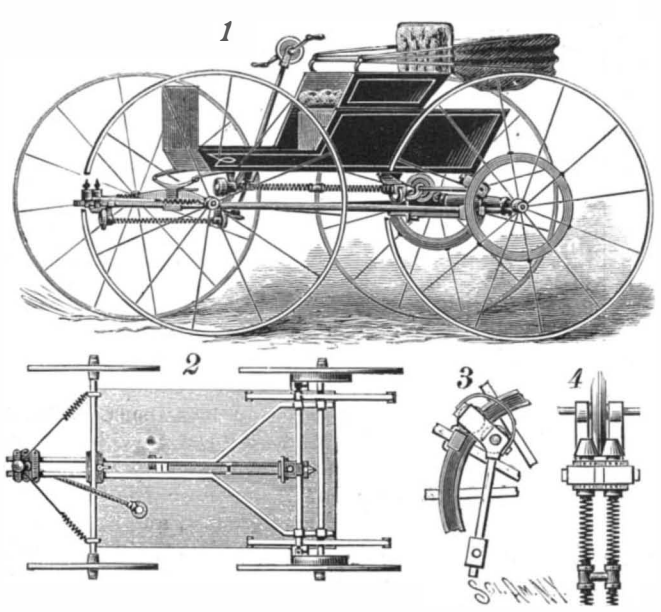


KUNKLE'S SAFETY VALVE.

When this locking nut is removed, the regulating screw may be turned, by means of a special form of key provided therefor, to regulate the tension of the spring, and thus determine the pressure at which steam shall be permitted to escape. Surrounding the valve seat, in the valve body, there is also a regulating collar, adapted to be screwed up or down to regulate the escape of steam passing through the valve seat, the collar serving to regulate the lifting force of the steam on the extended area of the valve. To open the valve at any time, a vertically sliding pin in a recess of the valve body is arranged to engage the under side of the flange at the top of the valve, the lower end of the pin being engaged by a projection on a lever at one side, as shown in the illustration. By placing the compression spring between centers, as provided for by this invention, all friction is obviated, and the tension at which the valve is set is not likely to be changed except by one having authority to take such responsibility.

A PROPELLING MECHANISM FOR VEHICLES.

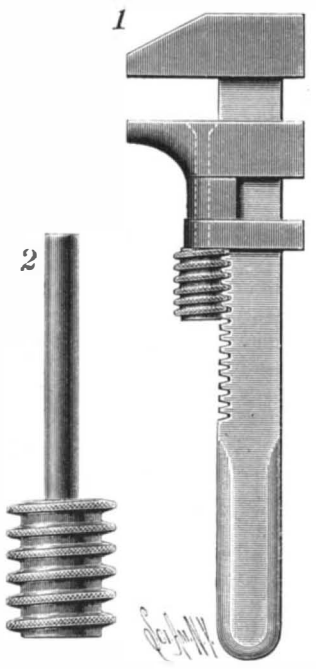
A driving device for vehicles, especially designed to remove the weight and strain from the axles, by placing the weight of the body and its accessories in continual suspension on the circumference of the advancing half of the drivers, is shown in the accompanying illustration. This improved vehicle, which is styled by its inventor the "Princess of the Highway," has been patented by Mr. M. A. Libbey, of South Berwick, Me. The improvement provides a power mechanism adjustable for varying lengths and widths, and designed for application to ordinary light road vehicles without marring the paint or varnish. Fig. 1 is a view in perspective, and Fig. 2 is a bottom plan view of an ordinary four-wheeled vehicle having this propelling mechanism, the body being supported by suitable springs resting on the axles in the usual way, and the front and rear axles being connected by a light frame, which projects beyond the forward axle to support a steering apparatus. The frame is pivotally attached to the forward axle, and spreading rear members of the frame extend below the rear axle, to which such members are attached by clips. Depending from each of the members, a little in front of the rear axle, is a clip, these clips supporting a hollow transverse shaft, from each end of which projects a rod, the outer ends of the rods having clamps which support upwardly extending spindles which terminate in boxes or frames. Each of these frames is adapted to support in effective operative position a pair of friction rollers, pressed firmly together by a spring, as shown in Fig. 3, there being interposed between the rollers the horizontal portion of a thin metal annular flange, attached to the spokes of each rear wheel, so that the rollers will press on opposite sides of the flanges. One of these friction rollers on each side is on the outer end of a transverse shaft, and on the inner ends of the shafts are friction disks, as shown in Fig. 4, to which power is transmitted through two spiral shafts extending forwardly under the box, a motor of any approved form being used. The shafts are composed of two or more strands of wire wound spirally, and stiffened by collars, to form a shaft which will be light and strong, and flexible enough to yield to the motion of the vehicle. In the forward part of the body is a case through which a steering shaft extends downward, a gear wheel on the lower end of the shaft operating a horizontal shaft of spiral wire, passing under the front axle to another gear at the forward end of the frame, and which moves a belt connected at each end to the front axle, whereby the latter may be readily turned to the right or left. The mechanism may be inclosed or open as desired.



LIBBEY'S DRIVING DEVICE FOR VEHICLES.

AN IMPROVED WRENCH.

The wrench shown in the illustration, patented by Mr. John Ryan, is composed of but three parts, and is designed to be very strong and durable, while being quick and easy of adjustment. The shank has the usual fixed jaw at its outer end, and its inner edge, for a portion of its length, is concaved and provided with screw threads. The adjustable jaw, held to slide on the shank by integral straps, is bored longitudinally, the end of the bore on the face of the jaw being countersunk. The operating nut, shown in Fig. 2, is made solid, and has a peripheral thread adapted to fit the threads in the concaved portion of the shank, the edge of the thread being milled. The nut also has an integral axial stem adapted to fit the bore of the adjustable jaw, the inner end of the stem being upset in the countersunk portion of the bore on the inner face of the jaw when the parts of the wrench are put together.

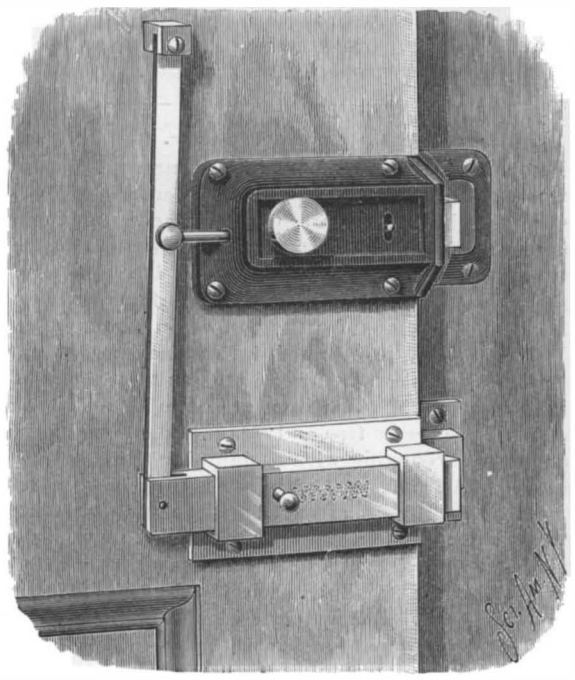


RYAN'S WRENCH.

For further information as to this invention address the inventor, or Mr. Seymour G. Smith, No. 127 Water Street, New York City.

A SAFETY BOLT FOR SPRING LATCHES.

The illustration represents a locking bolt independent of the latch of a door, but capable of being operated with the latch, to impart additional security to the door. The device has been patented by Mr. John Bradley, of No. 2416 Pennsylvania Avenue, Philadelphia, Pa. The latch may be of any approved make, and just above the latch, at its rear, is pivoted a vertical lever bar. A trip rod contacting with the rear end of the spring-actuated latch bolt extends through a rear aperture in the latch casing, and is pivoted upon the vertical lever bar, and the lower end of the latter bar is pivoted upon the rear end of a bolt held to slide upon the door and engage a keeper attached to the door jamb. A spring is located with-in the lower bolt, so that when the door is closed both bolts will automatically slide into their keepers, and when the latch bolt is moved back to open the door, the trip rod, through the vertical lever, causes the lower bolt also to be withdrawn from its keeper. The trip rod may be held to slide in suitable guides, and simply contact with the rear end of the latch bolt, or the rod may be pivoted to the latter, in which case the spring in the lower bolt may be dispensed with.

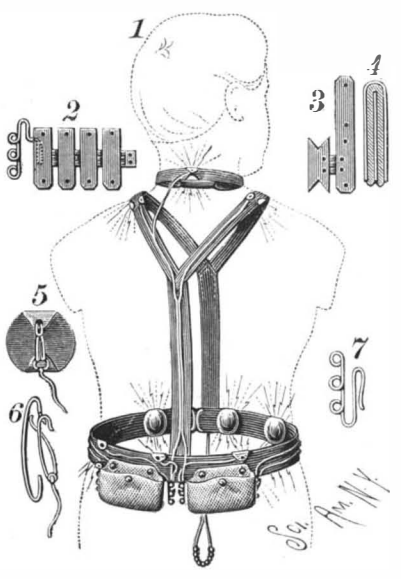


BRADLEY'S SAFETY BOLT FOR SPRING LATCHES.

AN ELECTRIC BELT AND BODY ATTACHMENTS.

The illustration represents a body battery with attachments to facilitate the effective sending of a current of electricity to different parts of the system, as may be desired in the treatment of acute and chronic diseases of various kinds, the electrodes contacting with the body without corroding, and without cutting or injuring the flesh. This improvement has been patented by Messrs. John A. Crisp and George F. Webb, of Jefferson, Ohio. The battery and attachments are shown in position in Fig. 1, a portion of the battery cells being shown in Fig. 2, while the blanks forming a cell are shown in Fig. 3, and a cross section through one of the cells in Fig. 4. The belt has upwardly extending straps leading to a shoulder support and neck yoke, and the cases adapted to contain the battery pockets are buttoned to the belt. The cases are preferably of leather-lined silk, and the pockets of cloth-covered rubber. Each battery is preferably composed of nine cells, each cell having a central copper plate and an outer zinc plate, with layers of felt to absorb acid placed between the copper and zinc. As shown in Fig. 3, the zinc plates are longer than the copper plates, over which they are doubled and fastened by rivets, the several cells being connected by hinges, the copper element of one cell being hinged to the zinc element of the next cell. The end cells of each battery have contact hooks by which the circuit may be cut out at any point on applying the hook to one of the hinges.

A spring-wire adjuster, shown in Fig. 7, has a bend to pass over the edge of the pocket and rings to engage the circuit hooks, with another bend adapted to clasp one of the hinges, wires leading to different parts of the body being conveniently connected with the battery through the rings, a spring snap-hook of special design, as shown in Fig. 6, being used to facilitate making such connection. The electrodes, shown in Fig. 5, are made of pure coin silver, and are made convex on the sides which are to contact with the body. As many of these electrodes are employed as is deemed necessary in the case to be treated, and each is connected by the ordinary covered copper wire with a battery. A different form of electrode may be used when desired for the special treatment of any particular portion of the body. To prepare the batteries for use,



CRISP & WEBB'S ELECTRIC BELT.

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they are first dipped in an acid, preferably cider vinegar, the belt and attachments being then placed on the body, the batteries inserted in the pockets, and the connections made between the batteries and the electrodes. Mr. Webb, one of the inventors of this apparatus, is a medical electrician who has had an extensive practice in the treatment of diseases by electricity, and he has received numerous testimonials from physicians and prominent people in his section of the country as to his success in this specialty.

A Patent Fuel Saver.

Few of us know how many benefits are yet in store for us, that keep latent until the keen eye of the inventor searches them out. One of our correspondents has recently sent us a sample of a patent coal-saving composition, but for obvious reasons it will be advisable to omit the name of the ingenious inventor.

A circular accompanies the sample, in which we find in large letters, "More heat! No black smoke! 50 per cent of coals can be saved! and suitable for all domestic purposes!" The circular states that the composition is perfectly free and clean, and can be used in a dry state, no mixing with or damping the coal being required. All that has to be done is to sprinkle a small quantity over the fire after it has been made up, which promotes combustion. Sitting room, sick room, office, and greenhouse fires can be kept burning from 6 to 15 hours without attention, when the fires are made up according to the simple directions given on each tin. The circular goes on to state that all the heat is thrown out into the room from the front of the fire, therefore combustion is obtained of the gas and coal tar, that in the ordinary way of things is allowed to pass off in smoke up the chimney. This is so burned that the fire lasts considerably longer, while also throwing out more heat.

The sample that has been sent to us has been analyzed in our laboratory, and we find it to contain: Common salt, 68 parts; chalk in powder, 32 parts.

The composition is sold in tins at 1s. each, which are stated to contain sufficient dressings for 150 fires.

Several newspapers have testified to the importance of this coal-saving composition. Whether the newspapers in question purchase and use it may be gathered perhaps by writing to the various editors; but we should hardly think that any one would be without such a valuable compound, if, as is stated, a fire can be made to burn for over 15 hours undisturbed in an ordinary office fireplace by merely sprinkling a few grains of salt over the surface of it.

The salting of coal to prevent smoke is a very old invention. It was proposed for Manchester many years ago, at a time, we believe, when Dr. E. Frankland was a resident there, and some very bitter controversies took place with regard to his advocacy of the salt smoke annihilator.

Let us now turn to the chemical side of the question. It is generally admitted on all sides that hydrochloric acid gas is more destructive to vegetation, and even to buildings, than sulphurous acid. It is more soluble in water (that is in the rain) than is sulphurous acid, and therefore falls in a more limited area and in a more concentrated state. It kills our trees and shrubs, and by falling on the greensward renders grass land one vast desert, as may be seen in Widnes and St. Helens; it dissolves carbonated building stones, and the mortar from between the brickwork. Sulphurous acid in similar places and under similar conditions is not so dangerous, for being soluble only to a slight extent in water, it is spread over a larger area, and thus becomes greatly diluted in comparison with hydrochloric acid.

What is now the effect of dusting common salt over the surface of burning coal? The sulphur of the coal during combustion becomes sulphurous acid, and this in the presence of air acting on the salt forms sulphate of soda and hydrochloric acid, which is to a large extent evolved and passes away with the products of combustion. It is true that some of this hydrochloric acid might become absorbed by the carbonate of lime with which the salt is mixed, but experimental trials made upon an ordinary house chimney with this coal-saving composition show us that hydrochloric acid is to be found in the escaping gases. In our experiments, dusting the coal-saving composition over the fuel in an ordinary office chimney, we have observed as much as 0·39 grain of hydrochloric acid per cubic foot, an amount nearly double that prohibited by act of Parliament in the case of alkali works.

It is on account of this dissemination of hydrochloric acid over such a vast area as that over which coal is consumed domestically, that we protest against the use of chloride of sodium as a smoke annihilator, though we in no wise desire to interfere with what seems to be a very lucrative business. Salt and chalk at 1s. per pound will no doubt make some of our readers' mouths water.—*Chemical Trade Journal.*

THE five-masted sailing vessel La France, which was illustrated in SUPPLEMENT No. 780, accomplished the voyage from Cardiff to Rio de Janeiro in 33 days. She was laden with 6,000 tons of coal.

The Diazo Photo-Printing Process.

The following process, by Dr. Feer, patented in Germany, depends upon the fact, which the inventor has discovered, that diazosulphonic salts ($R - N = N - SO_3 Na$) with phenolalkali, and chlorides of or free aromatic amines, react under the influence of solar or of the electric light, forming an azo dyeing substance.

For carrying out the process, the inventor impregnates paper or textile fabric with a dilute molecularic mixture of a diazosulphonic salt (for instance, of aniline, amidoazobenzole, benzidine, and their homologues) and phenol alkalies (for example, phenol, resorcin, and β-naphthol) or chloride of or free amines (aniline, naphthylamine phenylendiamine, and homologue). The paper or fabric is then dried in the dark, and exposed for about five minutes to the sun, or to the electric light. Thereby is formed in the illuminated portions an *insoluble* azo dye, while the parts protected by the opaque portions of the negative remain in their original colorless and soluble condition. The picture is thus developed while printing. It is, after exposure, washed with water, or with very dilute hydrochloric acid, whereby the unaltered sensitive preparation is washed from those parts not affected by light through the negative. The picture is thus fixed, and only requires drying to finish it.

The following are some examples of mixtures with which the paper or fabric is treated:

1.—Toluoldiazosulphonate of soda	25 grammes.
β-Naphthol	25 "
Caustic soda	8 "
Water	1,000 "
2.—Ditolyltetrazosulphonate of soda	25 grammes.
m-Phenylendiamine	8 "
Water	1,000 "
3.—Ditolyltetrazosulphonate of soda	25 grammes.
Resorcin	22 "
Caustic soda	16 "
Water	1,000 "

The following examples will illustrate the application of ditolyltetrazosulphonate of soda mixed with resorcin and α, β-naphthol respectively, and phenylendiamine.

Preparation of the Solutions.

1.—Ditolyltetrazosulphonate of soda	30 grammes.
Resorcin	20 "
Caustic soda	15 "

All, finely powdered, are dissolved by gentle heat in one liter of water.

2.—Ditolyltetrazosulphonate of soda	30 grammes.
α-Naphthol	25 "
Caustic soda	7 "

Dissolved in one liter of water.

3.—Ditolyltetrazosulphonate of soda	30 grammes.
Phenylendiamine	20 "

Dissolved in one liter of water.

The solutions 1 and 2, or 2 and 3, may be mixed in equal parts.

The paper is impregnated with the above mixture, and then exposed for from ten to fifteen minutes to direct sunshine. After exposure, the picture is washed with very dilute hydrochloric acid, then with water, and finally dried.

Claim.—A process for the production of colored photographic images on paper or textile fabrics, consisting of the preparation of the material with an aqueous or alcoholic solution of a diazosulphonic salt and a phenol alkali, benzene, a chloride, or free amine; dried in the dark, then covered by a negative, exposed to the influence of solar or the electric light, whereby an insoluble azo dye is formed only in the parts affected by light, the picture being thus developed; and, finally, the preparation unaffected by light is washed out with water or dilute hydrochloric acid, and the picture is thus fixed.

Planning a Great Aquarium for New York City.

For many years, Castle Garden, a large circular structure at the southern end of Mahattan Island, was the receiving depot for all the immigrants landed at New York, but the government has now made other arrangements for such service, and Castle Garden is at present unused, in the hands of the New York Park Commissioners. It is proposed to utilize the location for a mammoth public aquarium, for which purpose there could hardly be a more ideally perfect site. On the side toward the city is the well shaded but rather limited common now formed by Battery Park, while to the south the tides of New York Bay wash the walls of the present structure, Governor's Island and the statue of Liberty being in the near foreground, and the land and water prospect in every direction being of the most interesting character. Besides this, there is hardly any place in the city which crowds of visitors could so readily visit, at but little or no cost, either in money or time.

Mr. Eugene Blackford, the well known fish merchant and a State fish commissioner, has been asked to prepare plans for a great public aquarium here, and says that if the work is decided upon: "In the center of the garden we will sink several tanks to a level with the floor. These will be of different sizes. One, for the use of small whales, will have to be about thirty feet in diameter and eight or ten feet deep. Then there will be others of various sizes for the use of small sharks, crocodiles, alligators and all varieties of large fish. Another will be set aside for turtles and shellfish of all sorts, another for seals. Then, in a circle around the walls, we will build the small tanks. They will be about six feet long by four feet deep and two wide. Each tank will be built into a wall of imitation rock. The back and sides will not show, and only the front will be covered with glass. This will give each tank the effect of a pool of water in some rocky grotto. The lights will be so arranged that they will fall from above directly upon the water, thus illuminating the entire tank. The tanks will be arranged in groups, all the salt water fish will be in one group, the fresh water pond fish in another, those that live in running water will have quarters of their own, and so on. On the upper floor of the garden we propose to build large storage tanks for water. All our fresh water would have to settle before it could be used for the fish. From the fresh water storage tank would be run wooden pipes, lined with glass, to nearly all the fresh water tanks. Of course, in some of these it will not be necessary to change the water at all, plant and animal life being all that is necessary to keep some fish alive. In these tanks we will place marine plants of various kinds. These live on carbonic acid gas, which is given out by fish in breathing, and give out oxygen, which fish breathe. So, you see, it will not be necessary to have running water in all the fresh water tanks. There are some active fish, such as the trout and pickerel, that must be kept in running water. Through these tanks a stream of fresh water will run constantly. Then on small tables about the building we would place small tanks containing the smaller varieties of fish, such as the Japanese goldfish, whitebait, etc. We also will have a series of incubators showing the eggs of fish in each stage of development."

Jackson S. Schultz.

Mr. Schultz died in New York City, March 1, in the 76th year of his age. For upward of forty years he had been a prominent figure in New York life. He learned the tanning trade at his father's tannery in Delaware County, N. Y., but, while yet a young man, became engaged in the leather business on his own account in this city, and his connection with this line of business never entirely ceased until his death. As a tanner and leather merchant he occupied a unique position, not so much for remarkable financial success, although he early attained a strong position and acquired a handsome fortune, as from the fact that he was always interesting himself in matters designed to benefit the trade generally and to elevate the standard of the leather manufacture. He set on foot many investigations, and at his own expense made numerous experiments, with the view of improving tannery methods and practice, to lower the cost of production and make better leather, and the information he thus acquired was always freely at the service of even the humblest member of the trade. For many years a large portion of his time was surrendered to answering inquiries or giving advice to those who had no other claim upon him than that of trade interest. Perhaps the most widely known of his efforts in this direction, for the intended general benefit of the sole leather tanners, was the opposition he organized to the recognition of the validity of the Moses Thompson tan-burning furnace patent. A tedious law suit was the result, which cost the tanners about a hundred thousand dollars, many of the tanners also settling independently with the representative of the patentee, but the patent was finally sustained, although the damages awarded the complainant were only six cents.

One of the most valuable of the many books which have been published relative to the tanning industry is Mr. Schultz's "Leather Manufacture," issued by the *Shoe and Leather Reporter*, New York. Mr. Schultz did much to promote the establishment of an export trade in American sole leather, in which he was one of the pioneers, and also to establish the bark extract manufacture as a distinct line of business.

Apart, however, from his business as a tanner and leather merchant, Mr. Schultz was prominent in many ways in public life. He was an organizer and one of the presidents of the Union League Club, was a leading spirit in the work of the United States Sanitary Commission during the war, 1861 to 1865, was United States Commissioner at the World's Fair in Vienna, in 1873, and his energetic efforts could always be counted upon in every movement tending to hold public officials to a strict accountability and promote the cause of good government.

ALUMINUM at $1.25 per pound is in the market. A price list sent out to the trade by the Cowles Electric Smelting and Aluminum Co., of Lockport, N. Y., gives the following figures: In lots of more than 2,000 lb., $1.25 per lb., less 20 per cent discount, and in 1,500 lb., 1,000 lb., and 500 lb. lots, $1.25 per lb., with 15, 10, and 5 per cent discount. In 50 to 500 lb. the price is $1.25 net; 10 to 50 lb., $1.50; and less than 10 lb., $1.75 per lb.

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The Effect of Removing the Tassels on the Productiveness of Corn.

It has been claimed that if the tassels were removed from corn before they have produced pollen, the strength thus saved to the plant would be turned to the ovaries, and a larger amount of grain be produced. To test the effect of this theory, the following trial was made during the past season.

In the general corn field a plat of forty-eight rows, with forty-two hills in each row, was selected for the experiment. From each alternate row the tassels were removed as soon as they appeared, and before any pollen had fallen. The remaining rows were left undisturbed.

The corn was Sibley's Pride of the North, planted the last week in May in hills, three feet six inches by three feet eight inches, on dry, gravelly, moderately fertile soil.

On July 21 the earliest tassels began to make their appearance in the folds of the upper leaves, and were removed as soon as they could be seen, and before they were fully developed. A slight pull was sufficient to break the stalk just below the tassel, and the removal was easy and rapid.

On July 25 the plat was gone over again for the removal of such tassels as had appeared since the previous work, and at this time by far the greater number of the tassels were removed.

On July 28, when the plat was gone over the third time, the effects of the tasseling became apparent in the increased number of silks that were visible on the rows from which the tassels had been removed. On the 1,008 tasseled hills there were visible 591 silks; on the 1,008 untasseled hills, 393 silks.

On August 4 the plat was gone over for the last time, but only a few tassels were found on the very latest stalks. The preponderance of visible silks on the tasseled rows was still manifest, there being at this time 3,542 silks visible on the tasseled rows, and but 2,044 on the untasseled rows.

The corn was allowed to stand without cutting until ripe.

On September 29 to October 1, the rows were cut and husked, and the stalks and ears weighed and counted, with the following results:

	Aggregate Yield.		Comparative Yield.	
	Tassels left on.	Tassels removed	Tassels left on.	Tassels removed.
Number of good ears.....	1,551	2,338	100	151
" " poor ears..... ..	628	885	100	141
" " abortive ears.....	2,566	951	100	37
Total number of ears..... .	4,745	4,174	100	88
Weight of merchantable corn, pounds.....	710	1,078	100	152
Weight of poor corn, pounds..	130	187	100	144
Number of stalks.....	4,186	4,228	100	101
100 stalks weighed, pounds...	82	79	100	96

It will thus be seen that the number of good ears and the weight of merchantable corn were both a little more than fifty per cent greater on those rows from which the tassels were removed than upon those upon which the tassels were left. This is not only true of the two sets of rows as a whole, but with the individual rows as well. In no case did a row upon which the tassels were left produce anywhere near as much as the tasseled rows on either side of it. In fact, the results given above are really the aggregate results of twenty-four distinct duplicate experiments, each of which alone showed the same thing as the aggregate of all.

By abortive ears is meant those "sets" that made only a bunch of husks, and sometimes a small cob, but no grain. It will be noticed that they were by far the most numerous on those rows from which the tassels were not removed. It will also be noticed that the total of the good, poor, and abortive ears is about fourteen per cent greater on the rows on which the tassels were left, while the weight of merchantable corn is more than fifty per cent greater on those rows from which the tassels were removed.

While for a single trial the results of this experiment seem particularly marked and conclusive, it yet remains to be determined whether it will pay for a farmer to remove any considerable proportion of the tassels from his corn, what proportion it will be best to remove (for some evidently must be left), and whether all that it is advisable to remove may be taken off at one time or not. So far as we could estimate the time taken, it certainly paid us from a commercial standpoint to remove all the tassels from one-half the rows this year. It is also still to be determined whether the removal of the tassels would be followed with the same effect in a season and on a soil where there was abundant moisture for all the needs of the plant at the time when the tassels were shooting and the ears forming.—*Cornell Bulletin, Ag. Exp. Station.*

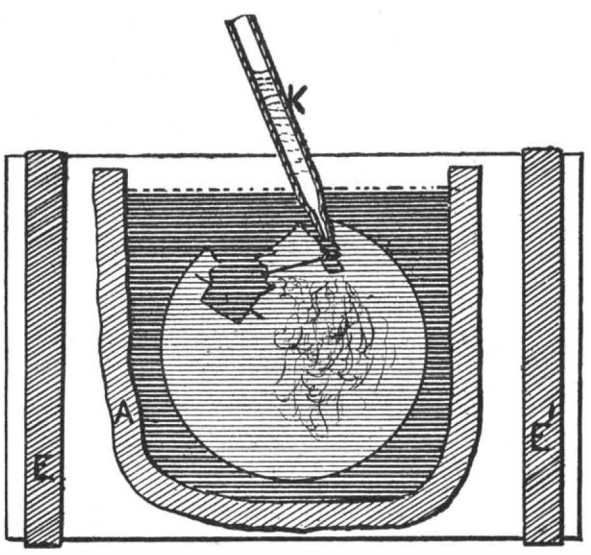
SUBMARINE TELEGRAPH CABLES.—With one or two trifling exceptions, the submarine cables of the world, which stretch over 120,000 nautical miles, and have cost $200,000,000, are of British construction.

A SMOKE EFFECT WITH A SINGLE LANTERN.

The effect of rising smoke in magic lantern pictures is generally produced by means of a double lantern. Upon one of the slides there is a picture in which smoke will come in conspicuously. The other slide is a rackwork arrangement, by means of which the effect of moving smoke is produced upon the screen.

The accompanying figure illustrates a method by which quite a natural smoke effect may be produced with a single lantern; though the variety of pictures to which the effect may be applied is more limited than it is when the older method is employed. The simple manner of constructing a transparent cell is not new. A method which is practically the same is described by Mr. Hopkins in his book, "Experimental Science."

In this case the bottom and two sides of the cell are formed by a piece of soft rubber tubing, A, bent as shown in the figure, and clamped between two glass plates by means of rubber bands, E E'. The glass plates are of a size suited to the slide stage of the lantern. If the cell leaks when filled with water, this may be stopped by greasing the tubing with lard. Upon one of the glass sides is pasted a mask of black paper, having a large circular opening in the center. A silhouette of the head and shoulders of a man smoking a pipe is pasted upside down in the upper part of this opening. K is a piece of glass tubing drawn out to a point and broken off so as to leave a small opening at the narrow end. The cell is filled with a moderately strong solution of some soluble sulphate. The glass tube is partly filled with a solution of baric chloride, by dipping the pointed end into that liquid to a depth of about an inch, and then removing it with the finger placed over the upper end. The outside of the tube is then wiped dry. If the small end of the tube is now held in the cell about half an inch above the



bowl of the pipe, and a little of the chloride is allowed to escape by moving the finger at the upper end, a cloudy precipitate of baric sulphate will descend through the liquid. When this operation is projected upon the screen, the cloud will appear to rise from the bowl of the pipe. The tube should occasionally be placed behind the face of the silhouette, to produce the effect of smoke issuing from the mouth of the smoker. It requires a little practice to make sure of producing smoke clouds of a natural appearance. It will be observed that the tube must be kept hidden behind some part of the picture.

Of course this effect may be applied to quite a variety of silhouette slides. It may also be used with transparent pictures whose foreground is dense enough to hide the tube and precipitate. In some cases, where the column of smoke may be of considerable width, the end of the tube need not be brought behind the visible part of the picture at all. No doubt other precipitates than baric sulphate will answer equally well.

LANGTON BYLLESBY.
254 Allegheny Ave., Allegheny, Pa.

Rapid Telegraphing by the Wheatstone Machine.

The most valuable factor in carrying on the immense volume of telegraphic business between New York and Chicago, during the breaking of wires by the storm of January 25, was the Wheatstone instrument, as stated by Acting Wire Chief C. B. Mitchell to a reporter of the New York *World*. The Wheatstone is a duplex machine which the telegraph people refer to as the "old mill," because it can grind out such an amount of "copy." An expert telegraph "sender" can transmit forty words a minute. The Wheatstone can do ten times as much and keep it up indefinitely. All that is necessary to do is to take the dispatches which are to be sent and give them to a man who takes a punch and cuts dashes and dots and spaces into a strip of paper to represent the letters of the message to be transmitted. When he gets through this operation, the perforated slip looks not unlike a sheet of orguinette music, only it is not so wide. When several thousand words have been properly prepared, the strip of perforated paper is fed into the mouth of the old mill and the message is ground out at the other end of the line at the rate of four hundred words a minute. The machine works mechanically and does not require an operator of skill. The transmitted message is received at the other end in the shape of a strip of paper punched full of dots and dashes representing the Morse alphabet. This strip is cut up into sections and placed in the hands of expert typewriters who read the Morse alphabet, and the message is reproduced in printed characters. This machine will furnish work enough to keep ten girls busy copying. During one of the most trying days of the recent storm the longest time there were open wires between New York and Chicago was about one hour, and the Wheatstone transmitted 30,000 words in that brief space of time, thus doing the work of ten expert senders. Had it not been for this, there would have been a great load of delayed business that day.

Joaquin C. G. Vianna.

The central figure of the India rubber world at the present time is Joaquin C. G. Vianna, or Baron de Gondoriz, who, backed by foreign and native capital, is boldly endeavoring to corner the entire rubber output of the Amazon region. About forty-five years ago, Vianna first saw the light of day in a small village near Oporto, Portugal, and at an early age was sent, as was the custom with well-to-do people in his country, to England, to receive an education. He was bright, studious, and industrious to a remarkable degree, as shown in the letters which he often writes to this country, and which are written in a smooth, flowing hand, and are models of English business diction. He also speaks our language without the slightest accent, and with grammatical accuracy.

Going to Para at an early day, he entered the house of Victor Roiz d'Oliveira & Co., as a clerk, but the senior partner of that company afterward retiring, he succeeded him in the partnership. It was then that he began to show signs of his intrepidity in attempting to control rubber values, for in a short time afterward he formed the firm of Vianna & Co., and attempted to corner the market.

The manufacturers of this country combined against him, and an eventful struggle commenced. Vianna forced the price up to $1.25; but the united efforts of his opponents were too much for him, and he reluctantly yielded after a campaign of nearly a year's duration, with heavy losses. He was next heard of in the firm of Barros & Vianna; then in the Uniao Commercial, firms which he carried on with good success until 1887, when he formed the Nova Uniao, with increased capital, but its operations were unfortunate, and its affairs soon passed into liquidation.

At this time his brother, much younger than he, had formed the company of J. Vianna & Co., while he himself united his fortunes with the Cia Mercantil of Para, a company which at the beginning of the season was credited with the purpose of controlling the rubber product of the Amazon. Other companies have lately sprung into existence, the Empreza Industrial do Gran Para, under the auspices of the Banco Emissor, and the Empreza Industrial do Norte y Oeste do Brazil—results of the great prosperity in that country in the past year. The bank has a very large amount of capital at its disposal, and as it is credited with an understanding among the rubber men to advance any reasonable amount to them, this feature is a very strong factor in the situation. As a consolidation of all interests in Para has now been made, and placed under the control of Vianna, nothing now remains but to execute the scheme, the success of which seems to rest entirely upon Mr. Vianna. A knowledge of his personality is, therefore, interesting at this juncture.

His abilities command the admiration and confidence of his associates, both at home and abroad. He is clear headed, incomparably bold, quick of decision, fertile in resource, active, and with these qualities is combined a resolute will which does not discern defeat until the last gun has been fired. This is the man who will be carefully watched for the next few months, and whose name will probably be in the mouth of many a person who happens to get short of a contract in the market. In appearance, the Baron de Gondoriz is about five feet four inches tall, of full habit, light complexion, and red hair. He smokes the conventional cigarette of the country, but does not taste liquors. He is a good companion, agreeable in manner, and chummy in conversation. He is married, the baroness being a Para lady of excellent family and wealthy. The title he bears comes to him from the king of Portugal, whose subject he remains. He is a good traveler, visiting this country and Europe quite often, and in New York is quite well known. His acquaintances here say that he is quite able to hold his own, in business matters and leadership, with the best minds in Wall Street.—*India Rubber World.*

NATURAL GAS IN ENGLAND.—The Salt Union borings have been proceeding simultaneously in Cleveland and Cheshire. It is reported that in the former district natural gas has been struck and issues in great volumes.

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MANUFACTURE OF HEAVY GUNS FOR U. S. NAVY.

(*Continued from first page.*)

Characteristics.	Tubes.	Jackets.	Hoops.
Tensile strength..	70,000 to 80,000 lb	74,000 to 85,000 lb.	90,000 to 100,000 lb
Elastic limit.....	33,000 to 38,000 lb.	34,000 to 40,000 lb.	45,000 to 50,000 lb
Elongation.....	12 p. c. to 22 p. c.	10 p. c. to 20 p. c.	12 p. c. to 15 p. c.
Contraction of area.....	15 p. c. to 35 p. c.	12 p. c. to 30 p. c.	15 p. c. to 30 p. c.

The Washington Gun Factory, where all naval guns are now fabricated, is an outgrowth of the old Washington Navy Yard, and is very favorably situated because of its proximity to the control of the department and the inspection of Congress. It is reasonably secure from foreign invasion, in good railroad communication with the steel factories, and connected by water with its proving ground, at Indian Head, on the Potomac, 26 miles below Washington.

Approaching the arsenal by the main entrance, the most prominent object is the large new factory (Fig. 1), in which the heaviest guns are being manufactured. Commenced in 1886, it is now in full working order for the fabrication of guns up to and including 12 inches caliber, and there is every reason to hope that within the next eighteen months the lathes for the 13-inch, 14-inch, and 16-inch guns will be in such an advanced state that their erection can be commenced.

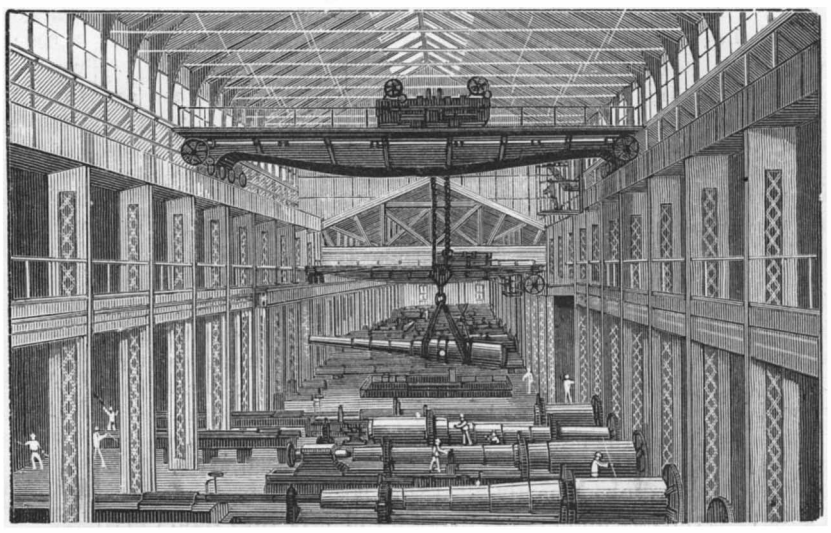

Fig. 8.—INTERIOR OF GUN SHOP AND MAMMOTH TRAVELING CRANE.

Fig. 8 shows the interior of the large gun shop, in the foreground of which will be placed, when completed, the heavy lathes mentioned above. These lathes will be served by the 110-ton overhead traveling crane recently erected and tested. This crane is composed of a bridge which travels lengthwise the shop, a trolley that traverses on the bridge, or girders, across the shop, and which is fitted with the gearing that hoists and lowers the weight to be moved. The power (steam) is transmitted through square shafting, the motions being controlled by clutches.

Fig. 5 represents the lower block of the purchase for hoisting and lowering, and will convey, by comparison with the life-size figures in the sketch, the enormous strength for which preparation must be made.

The two principal sections of the new gun factory are designated as the *north* gun shop, where the guns of the larger calibers will be completed, and the *south* gun shop, where the smaller calibers will assume their finished shapes under the service of a 40-ton traveling crane. Both of these cranes are seen in the cut, together with the lathes and other machines installed and in full operation in the south gun shop. All of these tools are set in the direction of the width of the building, much economy of space and better crane service being obtained by this distribution.

On their arrival at the arsenal, the cars containing the forgings are run under the overhead cranes, which quickly remove and place the forgings in their respective lathes (Fig. 9) for boring and turning. Frequently these two operations are done at the same time, cutting tools shaving off the outside of the tube while the "hog bit" (Fig. 6) is taking its first and second boring cuts.

The tube is very carefully turned and accurately gauged for the reception of the jacket and hoops, which, after being as accurately machined, are to be shrunk into place.

The shrinking pit (Fig. 2) is a deep excavation lined with brick and fitted with adjustable platforms for adaptation to the lengths of the parts of the different calibers. It contains, also, furnaces of sizes adapted to the dimensions of the jackets and hoops to be heated previous to the assembling, which are expanded until they are large enough to be dropped easily over the tube, jacket or previous layer of hoops. Wood fuel is employed to raise these parts to the requisite temperature. Great difficulty was experienced in excavating the shrinking pit, and it proved to be an enormously expensive undertaking, owing to the existence of quicksand where it was deemed most advisable to locate it. The pit has proved, however, very satisfactory for all work thus far done, which has covered the assembling of guns of 10-inch caliber. When ready, the tube, breech end up, is placed in a vertical position by the overhead crane and the jacket lifted from its heating furnace and lowered over the tube into its proper position.

Water circulating through the tube causes a gradual decrease of the temperature until the jacket, which was machined to have an inside diameter slightly less than the outside diameter of the tube, grips the tube by a previously calculated shrinkage equal to the compression increased by the extension. The gun is then reversed for the placing of the chase hoops. These and the other strengthening bands may be assembled while the gun is in the lathe if this method should be preferred or if the appliances of the shrinking plant should be otherwise employed. For the heavier calibers, gauges are fitted over which the jacket and longer hoops are dropped before being finally placed on the tube itself. This is a very necessary precaution, as costly experience has already pointed out; for if any portion of the jacket should become set before the entire jacket has reached its proper position, it would probably have to be turned off in the lathe and be destroyed. The naval gun factory has thus far been very fortunate, and has, we believe, lost but very few forgings from this cause.

When all the parts have been shrunk in place, the trunnion band, when used, is screwed on, and in some types of construction assists to lock the parts together, the gun is finished turned and polished, and the final boring cut taken with a packed bit (Fig. 6). This last operation and that of rifling are conducted by very skillful mechanics, as any error in these, the finishing touches to the bore and rifling of the piece, would cause its ruin.

Fig. 3 represents the cutting of the chamber. This, as well as all others of the finishing operations, requires mathematical accuracy, the gun, when completed, being a much more perfect mechanical contrivance than the majority of timepieces on which we are accustomed to rely from day to day.

To rifle the gun, it is placed in a rifling machine (see Fig. 5 of our issue of Feb. 28, Vol. LXIV., No. 9), firmly supported in heavy steady rests. The machine is horizontal, carrying a bar whose cutting head operates during withdrawal. Various devices are employed for regulating the twist or inclination of the grooves. As a rule only a single groove is cut at a time, but a few machines employ a greater number of cutters in the head. The latter practice is followed at the Washington factory.

The rifling is right handed and begins at the forward end of the compression slope. In the latest designs for 6-inch it has a twist of one turn in 180 calibers, at a distance of 144 inches from the muzzle, and increases to a twist of one turn in 25 calibers. This increase gives greater steadiness in flight and the power to use longer projectiles than could otherwise be employed. The grooves are wider at the origin than at the muzzle.

We now come to the preparation and fitting of the breech mechanism, much of which has to be done by hand, as shown in Fig. 4.

The breech is closed by the interrupted screw system, universally known as the French, the De Bange elastic pad and mushroom head having been adopted by the United States as much the best of the several systems tried.

As soon as the breech mechanism is complete, the sights and elevating band are adjusted and a final examination made preparatory to proof.

The sequence of the operations above described may be varied to meet the conditions of the various machines through which the gun must pass during the different stages of its manufacture, but boring and turning lathes, planers, slotters, shapers and milling machines, drills, rifling machines, must each have their share in the final moulding to form, guided and governed by micrometer gauges and calipers to assist in securing the best ballistic results.

The gun is now taken to the proving ground for final test, previous to its finding its way to the barbette, turret, sponson or other support of the ship to which it may have been assigned. The responsibility of the steel maker will be appreciate when we recall the fact that the forgings of which the gun is composed are not finally accepted until the gun has successfully passed five powder proof rounds with service charges. As several months are required to assemble and finish the larger guns, it is evident that a long time must elapse before this final demand can be satisfied. The powder is manufactured by Dupont & Co., who have met with much success in developing progressive powders suitable for the various calibers.

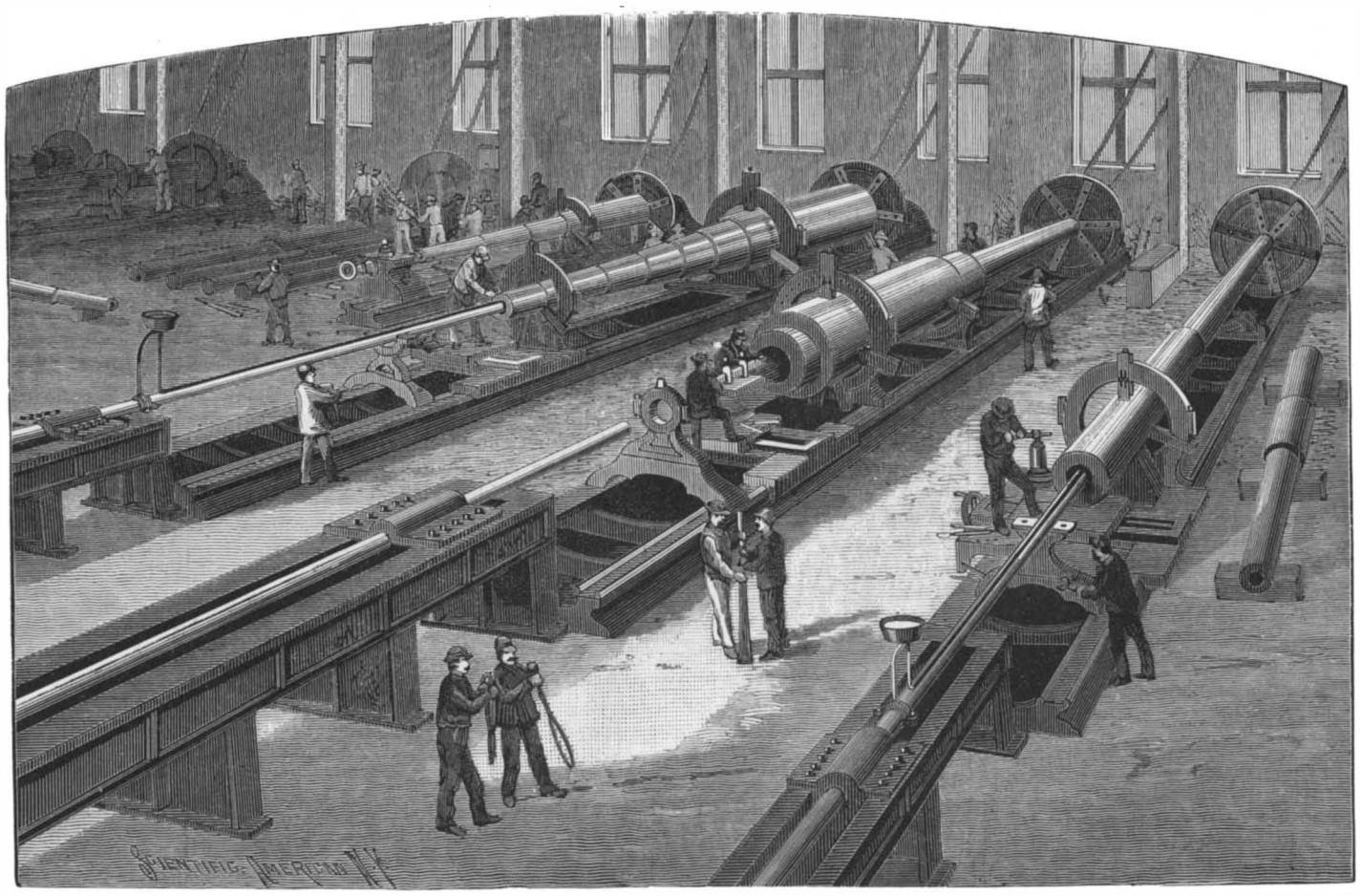

Fig. 9.—LATHES FOR BORING, TURNING AND CHAMBERING HEAVY GUNS, WASHINGTON.

The common shell and shrapnel are manufactured at the Washington factory.

Fig. 10 represents a 10-inch projectile in the lathe having its cone turned, while Fig. 7 shows the method of securing the copper bands which take the grooves in the bore of the gun and govern the amount of

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twist. A cylindrical groove is cut near the rear end, into which the copper band is forced by hydraulic pressure.

The United States has not yet succeeded in securing a domestic supply of armor-piercing projectiles, but experiments are in progress which may result favorably.

But as far as that which concerns the supply of modern high-powered ordnance, our sketch shows how thoroughly the Bethlehem Steel Works and the Washington gun factory have released us from dependence upon foreign industries and what strides we are making to regain our lost prestige in the science and art of gun making.

The New Fire Boat New Yorker.

This splendid addition to the fire department of the city of New York, which was illustrated and described in the last number of the SCIENTIFIC AMERICAN, had the first opportunity to prove her efficiency at a fire on March 5. A large steamer, the City of Richmond, loaded with cotton, rubber, sugar, etc., took fire at a pier near the great suspension bridge over the East River. The fire spread with great rapidity, and the steamer was quickly enveloped in flames. As described by the New York *Sun*, "All was blazing merrily when the fire boat came up opposite the end of the pier, her whistle wailing like a lost soul. While yet a long way out in the stream she brought the fire in view. There was a movement of the captain in the pilot house, the men at the standing pipe at her bow gave a valve a whirl, and in an instant such a stream of water as the people along shore never saw before burst from the four and one-half inch nozzle. Over the corner of the pier, over the host of harbor tugs gathered there, and straight into the heart of the blazing mass of woodwork, the stream drove with all but irresistible power. It was as large as a man's body where it struck the fire. The flaming walls and bulkheads of cabin and staterooms about the bow went down before it like paper, and splintered boards were hurled in all directions. It was almost as if cannon were battering at the wreck. From a position on the port bow the New Yorker worked her way slowly into the slip among the tug boats until she had literally raked the City of Richmond from stem to stern. Next she turned her liquid battery on the nearest pier shed, tearing the blazing roof to pieces and drowning out the fire there before the spectators had noticed that she had left the steamer."

How to Cure a Headache.

In case of the ordinary nervous headache, from which women suffer so much, says an authority, remove the dress waist, knot the hair high up on the head, out of the way, and, while leaning over the basin, place a sponge soaked in hot water, as hot as can be borne, on the back of the neck. Repeat this many times, also applying the sponge behind the ears, and, if the assertion of the writer is not a mistaken one, in many cases the strained muscles and nerves that have caused so much misery will be felt to relax and smooth themselves out deliciously, and very frequently the pain promptly vanishes in consequence. Every woman knows the aching face and neck generally brought home from a hard day's shopping, or from a long round of calls and afternoon teas. She regards with intense dissatisfaction the heavy lines drawn around her eyes and mouth by the long strain on the facial muscles, and when she must carry that worn countenance to some dinner party or evening's amusement, it robs her of all the pleasure to be had in it. Cosmetics are not the cure, nor bromides, or the many nerve sedatives to be had at the drug shop. Here, again, the sponge and hot water are advised by the writer quoted, bathing the face in water as hot as can possibly be borne; apply the sponge over and over again to the temples, throat, and behind the ears, where most of the nerves and muscles of the head center, and then bathe the face in water running cold from the faucet. Color and smoothness of outline come back to the face, an astonishing freshness and comfort is the result, and if a nap of ten minutes can follow, every trace of fatigue will vanish.—*Analyst.*

A Smart Iowa Boy.

An ingenious youth out in Iowa tied a thread to a nickel, dropped the nickel in a slot machine, got what he wanted, then, withdrawing the nickel by the thread, repeated the operation until he had made a clean sweep of the receptacle's contents.

He was arrested on a charge of theft, but the judge who tried him held that he had committed neither burglary, larceny, nor robbery, nor even obtained property under false pretenses. He had merely done what the inscription on the machine told him to do—drop a nickel in the slot—and had kept on doing it. Nothing was said about leaving the coin where it was dropped. The decision will probably abate a nuisance.

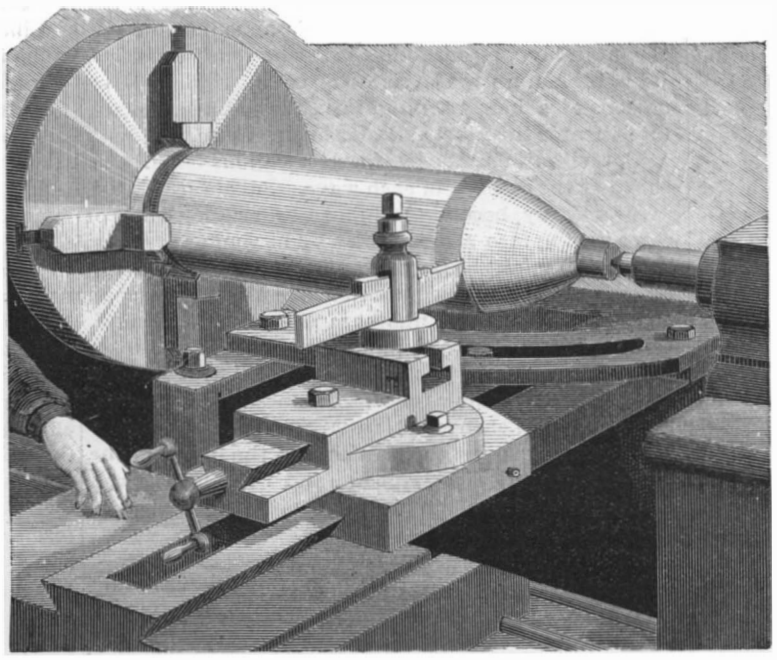
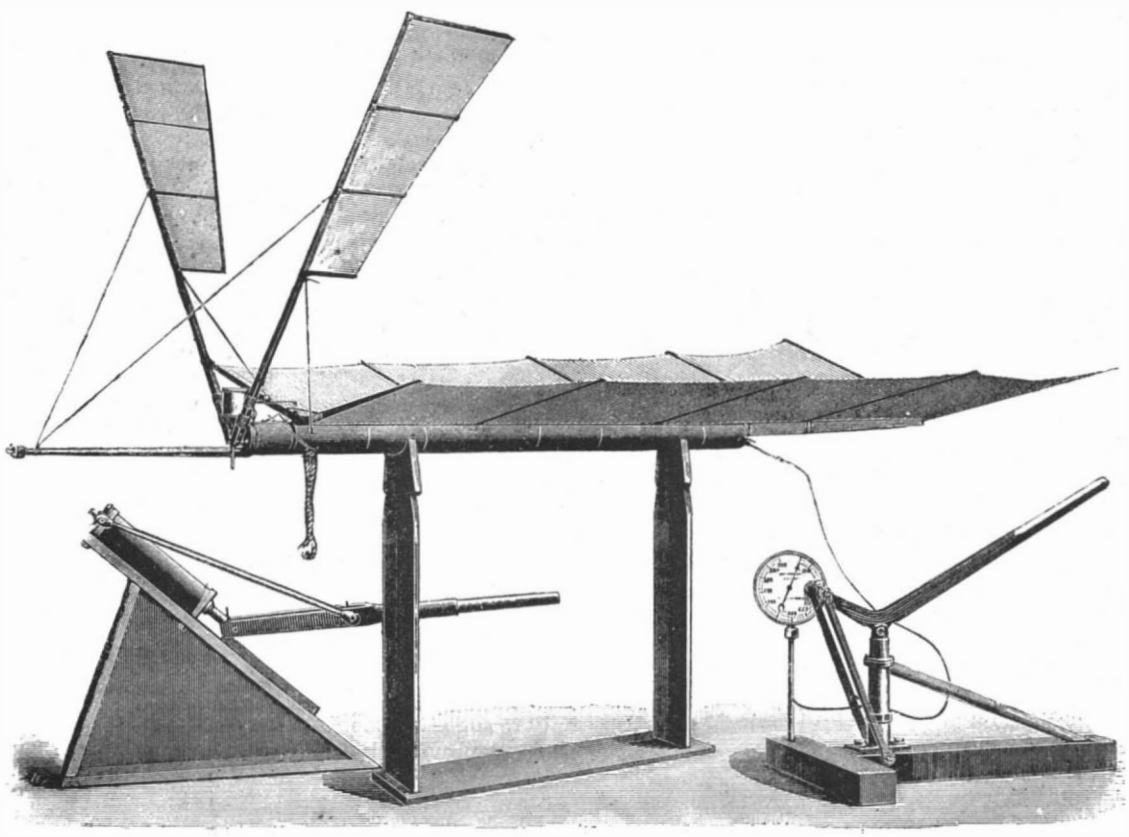


Fig. 10.—TURNING 10-INCH PROJECTILE.

A PNEUMATIC FLYING MACHINE.

This is a flying machine constructed by Mr. Lawrence Hargrave, of Sydney, N. S. W. It is propelled by an engine fed with compressed air, and, as will be seen from the engraving, which is from *Engineering*, the machine is a marvel of lightness and ingenuity.

The compressed air is stored in a tube which forms the backbone of the whole construction. This tube is 2 inches in diameter, 48¼ inches long, and has a capacity of 144·6 cubic inches. Its weight is 19·5 ounces, and the working pressure 230 pounds per square inch.



A PNEUMATIC FLYING MACHINE.

The engine cylinder has a diameter of 1½ inches and a stroke of 1¼ inches, while the total weight of the engine is only 6½ ounces. The piston rod is made fast to the end of the backbone, and the cylinder moves up and down over the piston. Two links connect the cylinder to the Canadian red pine rods which carry the wings. The air is admitted to the cylinder, and exhausted by means of a valve worked by tappets. The period of admission continues through the entire stroke. The cylinder and receiver ends are pressed, and the piston is made of vulcanite, with a leather cup ring for packing.

The wings are made of paper, and have no canting or feathering motion other than that due to the springing of the material of which they are made. The weight of the wings is 3 oz. To find how much the wings deflected, one was held by the butt and a weight of 7½ oz. was put on the membrane 24 in. from the fixed point and 1⅝ in. abaft the wing arm. The deflection produced, due to torsional stress, was 3½ deg. By moving the weight half way across the wing it was twisted 8¼ deg. The area of the body is 2,128 square inches; the area of the wings 216 square inches; and the total area, 2,344 square inches.

When first made, the machine had its center of gravity so placed that the percentage of area in advance of it was 30 per cent of the whole area, but continued disaster caused its reduction to 23·3 per cent. In a dead calm the machine flew 368 feet horizontally.

The engraving shows also two forms of pump for compressing the air. Each has a bent lever handle and long links on the principle of the Stanhope press, so that the most powerful leverage acts on the cylinder full of air when it is reduced to its smallest volume. The ram is 1⅜ inch in diameter, and the stroke about 4½ inches. The receiver is charged in six minutes to 230 pounds, and 400 pounds pressure can be obtained by this pump.

A New Name and Draught Law for Vessels.

By the act of Congress approved February 21, 1891, the name of every documented vessel of the United States shall be marked upon each bow and upon the stern, and the home port shall also be marked upon the stern. These names shall be painted, or carved and gilded, in Roman letters in a light color on a dark ground, or in a dark color on a light ground, and to be distinctly visible. The smallest letters used shall not be less in size than four inches. If any vessels of the United States shall be found without these names being so marked, the owner or owners shall be liable to a penalty of ten dollars for each name omitted: *Provided, however*, that the names on each bow may be marked within the year eighteen hundred and ninety-one.

The draught of every registered vessel shall be marked upon the stem and stern post, in English feet or decimeters, in either Arabic or Roman numerals. The bottom of each numeral shall indicate the draught to that line.

The owner, agent, or master of every inspected sea-going steam or sail vessel shall indicate the draught of water at which he shall deem his vessel safe to be loaded for the trade she is engaged in, which limit as indicated shall be stated in the vessel's certificate of inspection, and it shall be unlawful for such vessel to be loaded deeper than stated in said certificate.

Blowing up a Wreck.

Ever since the collision, on September 28, just off the New Jersey coast, between the steamship Vizcaya and a schooner, the wrecks had formed an obstruction to navigation, although the government had placed whistling and spar buoys near by. Considerable portions of the masts of both vessels projected above the water, which had gone down where the depth was about sixty feet. The Yantic, of the U. S. navy, was sent to remove the wreck, which lay quite in the line of considerable coastwise navigation. Two boats were sent out, with torpedoes, each containing thirty-four pounds of gun cotton, equal to four times that weight of gunpowder, and two of these torpedoes were sunk alongside the schooner's masts. An electric wire from the torpedoes was fastened to the stern sheets of the boats, and the latter were rowed a distance of about two hundred yards away, when the wires were connected with an electric battery. The circuit was then closed, the explosion followed, throwing up a great volume of water, and all signs of the wreck of the schooner had disappeared. The same course was then followed with regard to the wreck of the steamer.

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Trial of Another New Gun Boat.

On February 28, the Bennington, a sister ship of the Yorktown and Concord, had a highly successful trial trip in Long Island Sound, for the testing of her machinery and the development of her maximum horse power. She is the last one of three twin-screw, coal-protected cruisers, of about 1,700 tons displacement and fourteen feet draught, designed to be readiiy available for the ordinary work of cruising in time of peace and effective commerce destroyers in case of war. The Yorktown * and Concord have already been added to the ships in active service in the navy.

The Bennington made her trial trip of a four hours' continuous run in a southwest gale, which caused her decks to be frequently swept by heavy seas, the water being driven into the ventilating funnels and flooding the fireroom floor. The board of trial consisted of Commanders Bridgman, Bradford and Hemphill, Chief Engineers Hine, Lowe and Heaton, and Naval Constructor Varney. The conditions were not favorable for attaining a high speed, but the vessel made 17·2 knots the first hour, and averaged sixteen knots per hour for the other three hours. The boilers and machinery are said to have worked splendidly during the entire performance, and the vessel is reported to have done better than did the others of her class on the official trials. The approximate result of the trial of the Bennington, in comparison with the Yorktown and Concord, is as follows, in round numbers, the official reports not being yet made up:

	Yorktown.	Concord.	Bennington.
Collected indicated horse power of main engines	3,205	3,314	3,361
Indicated horse power of air and circulating pumps	118	27	32
Indicated horse power, blowers	52	34	43
Indicated horse power, feed pumps	16	17	25
Indicated horse power, dynamos	..	8	8
Indicated horse power, steering engine	..	2	2
Aggregate collective horse power of main engines and auxiliaries	3,391	3,402	3,471

The Bennington was required to show an average of 3,400 horse power for four consecutive hours, and exceeded this by seventy-one horse power, which entitles her contractors to a premium of $7,100. After the test for horse power was finished, two hours were spent in putting the vessel through a series of evolutions to test the steering apparatus, the quick starting and stopping of the engines and the working of the twin screws against each other. The Bennington did the best on record in stopping at full speed and reaching full speed backward, using both engines. She stopped in one minute and six seconds while at full speed, while going a length and a half. Turning by using one screw with the other at a stop, and with second reversed, stopping and backing and steering by hand and by steam, taking sharp turns at full speed, were all found satisfactory.

The hull of the Bennington was built at the Delaware River Iron Works, Chester, Pa., the engines were built by N. F. Palmer, Jr. & Co., of the Quintard Iron Works, New York City, and the electrical apparatus was furnished by the Edison Electric Light Company.

Some Applications of Photography.

An interesting lecture on this subject was delivered lately at the Royal Institution by Lord Rayleigh, F.R.S. The lecturer, after referring to Mr. Muybridge's photographs of animals in motion taken by means of a movable shutter, said that rapidly occurring phenomena might also be photographed by the exposure of the lens to a flash of magnesium light or to the electrical spark. Neither of these flashes of light was absolutely instantaneous. Their degree of instantaneity might be estimated by means of a wheel with black and white divisions revolving at a great speed. If the flash were of sufficiently short duration, the wheel would appear to be stationary. A series of teeth cut in the edge of the wheel allowed the rapidity of their motion to be calculated by means of a siren. With a flash of magnesium light the wheel appeared of a gray color, and the flash was shown to last from one-tenth to one-fiftieth of a second.

A spark from a Leyden jar, however, made the wheel appear stationary. It had been shown that the duration of the principal part of such a spark was less than 1-25,000,000th of a second. Some idea might be formed of such a duration by considering that it was nearly the same fraction of a second as one second is of a year, as a year contains roughly 25,000,000 seconds.

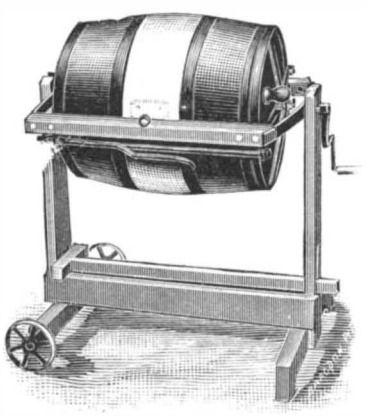
Multiple discharges from a Leyden jar might, however, last for 6-1,000ths of a second. In using the spark of a Leyden jar for instantaneous photography, it was better to connect the plates of the machine with the inside coatings of the jars, and photograph the object by a spark taken between the outside parts of the jars. There was thus no high potential, and less chance of losing the effect of the discharge.

* For illustration and full description of the Yorktown see SCIENTIFIC AMERICAN SUPPLEMENT, No. 687.

By means of instantaneous photography, it was seen that a jet of oxygen on passing through water was at once split up into bubbles on its first issuing from the tube. A jet of water, when made to issue into the air from a nozzle of drawn-out glass, was at first cylindrical, and then, becoming swollen or varicose owing to surface tension, was broken up into drops, each drop being connected with the cylinder by a thin ligament before it was separated. The vibrations of a tuning fork caused a column of water to break into drops at an earlier period. The ligament itself was afterward formed into one or two drops. Mr. Chichester Bell and Mr. Boys had observed these effects by taking instantaneous photographs of the shadow of the jet. When, however, a jet of any fluid is forced into a vessel containing another fluid the jet becomes sensitive, and is broken up into a series of coils. Under the vibrations of a heavy tuning fork, the jet becomes unstable nearer the nozzle. Under less pressure, and with regular vibrations, the jet forms a sinuous band, with a horn at the summit of each wave. Such a jet always gives way by becoming sinuous, whereas the jet of water issuing into air gives way by becoming varicose. A soap film might be photographed in the act of breaking, but as this occupied less than one-tenth of a second it was more difficult to photograph than jets of liquid. A dry shot was shown to pass through a soap bubble without breaking it, but a shot wetted with alcohol would break the film at once. By means of the dropping of weights suspended from an electromagnet, it was possible to make the breaking of the film and the flash of the spark simultaneous, and thus photograph the film in the act of breaking.

AN IMPROVED CHURN.

The churn shown in the illustration, patented by Mr. James McBride, of Bavington, Pa., is designed to make butter quickly, with the minimum of labor, while it is readily opened to receive the cream or for the removal of the butter. The barrel-shaped body of the churn has trunnions on its opposite sides which turn in keepers in a hoop, the hoop having flattened ends pivoted in the standards by projecting trunnions, to one of which is connected a crank. The body has a suitable lid or cover, readily secured in position or removed, and through which is a glass-covered opening, for convenience in observing the condition of the contents of the churn, and also an air vent closed by a stopper. Within the body of the churn are inwardly projecting longitudinal ribs, designed to form currents in the cream as the body is rotated, thereby hastening the separation of the butter. An adjustment may be made by which the body will be given an end-over-end motion if desired, but the position shown in the illustration is preferred, in which an axial motion is given by the crank, while at the same time the body swings lightly in the opposite direction, the churn turning very easily.



McBRIDE'S CHURN.

Terpene Iodide in Acute Diseases of the Lungs.

BY WILLIAM H. GREGG, M.D., NEW YORK.

For the past two or three years I have carried on a series of therapeutical investigations in search of some antiseptic agent that would act as a specific against the development of acute diseases of the lungs, more particularly acute congestion, pneumonia, and those catarrhal and throat affections which are so often the premonitory symptoms of more serious mischief.

While I have demonstrated to my own satisfaction that these diseases may be cut short, I am not so sanguine that the remedy will prove curative in all cases where a disease is once fully developed, yet further investigation may prove that it possesses specific properties even in these cases.

It has been my desire only to suggest some drug or combination of drugs which will prevent the ravages of the various cocci that are carried into the lungs through the agency of those septic storms which are so frequent in this climate, before an actual disease of the lungs has been established.

The great disadvantage the physician has to contend against in the administration of medicines is the changes they are liable to undergo when taken into the stomach before they finally enter the circulation. It would therefore appear that we ought to administer all of our remedies hypodermically, and perhaps this is the more rational way of obtaining their full benefit. But this mode has its objections. In the first place, it requires more or less skill; besides, it is painful, and at times is followed by unpleasant effects.

I believe that terpene iodide enters into the circulation unchanged, from the fact that it acts as quickly as if it were administered hypodermically. It is my judgment that the remedy offers greater success and produces happier results than any other of this class of remedies. While it is a powerful antiseptic, it is comparatively harmless, for, after prescribing it for several years, I have yet to meet with any unpleasant effect.

In acute affections of the throat it may be used in spray, while in other cases it may be given to adults in ten drop doses, on a teaspoonful of sugar, once or twice a day—in the morning and at bedtime. The morning dose should be followed by a glass of milk or bouillon. Larger or more frequent doses are apt to excite too great a discharge of urine.

I have no doubt that terpene iodide will, should it come into general practice, find a wider range of usefulness than that above indicated. As to its value in phthisis pulmonalis, diphtheria, and other zymotic diseases, I am unable to speak.—*N. Y. Med. Journal.*

Electricity from Light.

At a recent meeting of the Physical Society, London, Professor Minchin showed some experiments in illustration of his paper on "Photo-Electricity," read at the previous meeting. In one of these a seleno-aluminum battery, illuminated by the light of a taper, deflected an electrometer needle, thereby actuating a relay and ringing a bell. He afterward exhibited one of his "impulsion cells" in action, and showed the change from the insensitive to the sensitive state produced by a Hertz oscillator at a distance.

In the discussion, Mr. Tunzelmann said Kalischer and Von Uljanin had worked at the same subject, the former being the first to make experiments on a photo e. m. f. in selenium. His cells were made by winding brass wires on glass tubes and coating them with selenium, which was subsequently annealed. These cells lost their power after some time, and would not respond to feeble lights. By using two wires of different metals, he obtained better results. Fritts, in 1883, used brass and gold plates coated with selenium, and Uljanin employed platinum plates deposited so thin as to be transparent. The latter experimenter found that the e. m. f. was proportional to the square root of the intensity of the light. He also observed that the orange-yellow of the prismatic spectrum produced the greatest effect, whereas the yellow-green and green rays of the diffraction spectrum gave the maximum e. m. f. Comparing these results with Langley's observations on the energy of the spectrum, it would appear that the e. m. f. bears no relation to the maximum energy falling on the surfaces. Speaking of the cause of the phenomena, he said the electrolytic idea of Von Uljanin seemed inapplicable to Professor Minchin's results, and he inquired whether a mixture of selenium and aluminum would undergo a gradual change by exposure to light.

Dr. Gladstone said such a change, if it occurred, would be very slow, for nearly all difficult chemical reactions take time to complete. The fading of colors was adduced as an instance of slow chemical change produced by light.

Dr. Waller thought the subject might throw light on the changes occurring in the retina, and asked if it was possible to separate thermo-electric and photo-chemical effects.

Dr. Burton said he had suggested that the action of light on the retina was a photo-chemical one some time ago, but hitherto it had been difficult to obtain substances sensitive to any but the blue and violet rays, whereas the eye was most sensitive to green and yellow light. In the photo-electric batteries, however, the e. m. f. may generate a current, and therefore energy, and the important question seemed to be—Where does this energy come from? Is a chemical change precipitated by the action of light, or does a direct conversion of light into electric energy occur?

Professor Minchin, in his reply, said he thought his cells really transformed the incident energy. They were usually kept on open circuit, and there appeared to be no deterioration with time, the only change being a sluggishness in developing their maximum e. m. f.

Origin of the Word Bronze.

From an examination of texts due to the Greek alchemists, extracted from a document of the 16th century, Mr. Berthelot came to the conclusion, especially after comparing them with certain passages in Pliny the elder, that the name of bronze was derived from the city of Brundusium, the seat of certain manufactures in which this alloy was employed. Now, Mr. Berthelot has found a text that is more ancient by three centuries (for it dates back to the time of Charlemagne), and the indications of which are still more decisive. It is a question of a MS. found in the library of the chapter of the Canons of Luynes, and reproduced by Maratori in his *Antiquitates Italiæ*. In the Latin text it is expressly specified as "Composition of Brindisi:" Copper two parts, lead one part, tin one part—a traditional formula that has come down to our time. It would, then, seem indeed as if the word bronze was derived from the city of Brindisi, where bronze was manufactured on a large scale.—*La Genie Civil.*

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CHURCH ACOUSTICS.*

An examination of several church auditoriums was made recently with a view to determine whether any general principles could be discovered, appertaining to the acoustic qualities of a hall for public speaking, and also any special acoustic features that might reveal themselves in the particular rooms examined.

It was assumed that for a hall of good acoustic qualities:

(*a*) A low sound from the speaker should be audible in every part of the room.

(*b*) A sound from any part of the room should not be readily heard at the speaker's desk.

(*c*) The sound that is readily re-enforced by the resonance of the room should be as nearly as possible the pitch of the speaker's voice when used without effort.

(*d*) There should not be such effect of resonance or of echoes as to render rapid speaking indistinct or confused.

Five churches in Brooklyn were examined, and in each case the tests were made with reference to the four points named.

These tests were necessarily made when the rooms were unoccupied, and in consequence they did not perfectly represent the conditions met with when occupied by an audience, but some additional observations were made during church services in regard to the third and fourth points. As all the rooms were examined under similar conditions, the results justified a comparison of the five among themselves. Probably the greatest acoustic difference between a well filled auditorium and an empty one is in the echoes and the related effects of resonance.

To make the test of the effort required to produce a sound at one point which should be of a definite intensity at another point, the lowest sound that could be perceived plainly by a listener was the standard to be reached.

To a small trumpet, a reed instrument, of the key of F, which was near the note in each case to which the rooms resounded readily, was affixed a siphon manometer, which indicated the pressure of the air producing the sound of the instrument. It was shown by theory that the intensity of the sound at the instrument would be proportional to the pressure thus indicated, and preliminary experiments were made with the apparatus, which proved the practice to be fairly in accord with the theory. The force required, then, to make a sound just audible at various points, with the trumpet at a given station, was read off by the experimenter, from the scale of the gauge, in millimeters of the difference of level of water in the two arms of the U shaped gauge. The pressure requisite to make an audible sound with the listener close by the instrument was in each case first observed, and then the excess of pressure over this for other points was recorded.

The trumpet was then gently sounded at the pulpit, the pressure of the air being increased until the sound could be heard by the listener, in successive positions throughout the room. The location and distances of the points were recorded, as also the corresponding pressures requisite for each. These gave the data for the first point to be considered.

The listener, taking his place at the pulpit, while the trumpet was sounded at various places in the room, gave the data in the same manner for the second point.

A few trials with the voice determined the tone to which the room resounded forcibly, and the pitch as determined by a tuning fork was noted for comparison, later, with the tone of the preachers in conducting services.

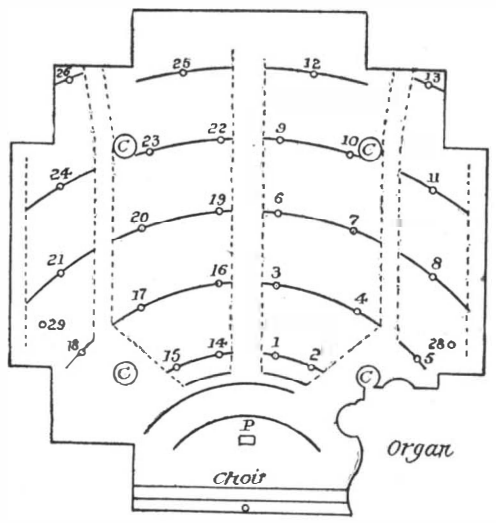
For the fourth point, the listener was stationed successively at various places, and the speaker at the pulpit read unfamiliar passages, in the resonance key as already determined, with various degrees of rapidity, and noted the rate of reading at which confusion was experienced by the listener.

The five auditoriums ranged in extreme dimensions from about 50 feet by 70 feet to 95 feet by 102 feet, and in seating capacity from 800 to 2,200, and were diverse in architectural style. Under the examination each readily displayed its own acoustic peculiarities.

The accompanying diagram and tables of the room No. 3 will serve as an example. In addition to the floor plan, it is necessary to understand the form of the ceiling in order to interpret the results. C C C C are columns four feet in diameter, from which, at a height of about twelve feet, rise circular arches, forming a transverse arch across the front and rear portions of the auditorium and a corresponding one along each side, with smaller arches at the corners. Above the central part of the room rise from the columns the four corners of a square dome or lantern, with a flat top at a considerable height above the crowns of the four arches. In the center hangs a large chandelier. It is the fourth column in each of the tables that is significant, as it shows the additional pressure upon the reed of the trumpet requisite to make a sound audible at various points in the room, as compared with that close at hand. It shows whatever of irregularity exists in any one hall, as well as the actual pressure required in the different cases. In No. 3 the pressure is seen to be irregular, ranging from 0 to 6 mm. of water, with an average value of 3·7 mm. It is not, however, so important that these numbers should be small as that they should be uniform.

In No. 1 they ranged from	0	to	1,	with an average of	0·2	mm.
In No. 2 " " "	0	to	2,	" " "	1·1	"
In No. 3 " " "	0	to	6,	" " "	3·7	"
In No. 4 " " "	0	to	4,	" " "	2·5	"
In No. 5 " " "	0	to	4,	" " "	2·2	"

Referring again to the first table of No. 3, the effect at 7, 8, and 21 is in striking contrast to that at 6, 19, and



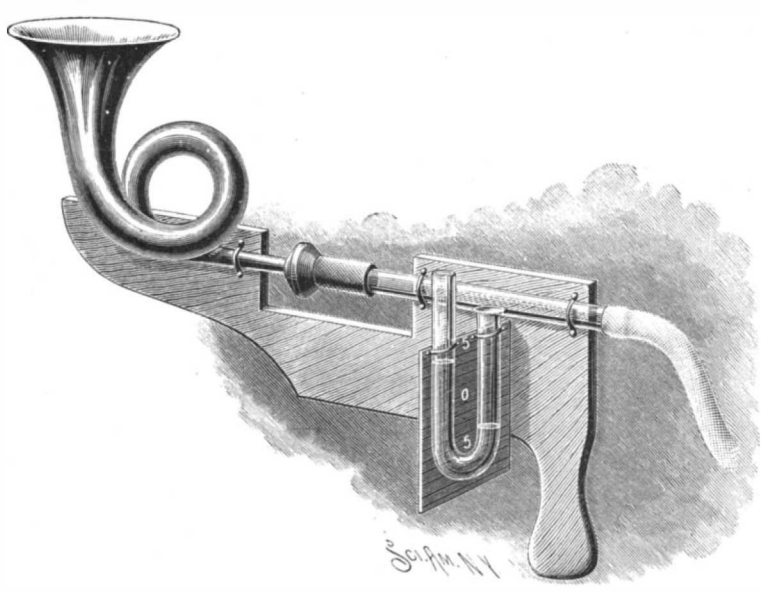
ROOM No. 3.

20, as shown by column 4. Positions 8 and 21 are under the arches whose axis is transverse to the church, and slightly forward of the axis; 19 and 6 are at the same distance from the pulpit, but are under the lantern.

Looking at the table of the "reverse series," it is seen that in most of the positions a less force is needed to produce a sound that would be audible at the pulpit than in the direct order. This peculiarity showed itself in every one of the rooms, and in a marked degree.

In No. 2, however, when the trumpet was sounded at the organ, which was to the rear and above the preacher, no increase of pressure could be detected, to be heard at the center of the room and at the farthest position, a distance of seventy-five feet.

The most difficult feature to deal with, in the acoustics of an auditorium, is the so-called echo. It is questionable whether all cases of such effects are genuine echoes. Still, the effect, if detrimental to distinctness, is objectionable by whatever name it may be known.



HERING'S PHONOMETER.

An echo is the repetition of a sound by reflection, to a hearer, after an interval of time long enough to permit him to distinguish the second sound from the first. The usual limit of time allowed for thus distinguishing two articulate expressions is one tenth of a second, and in this length of time a sound will travel 110 to 115 feet. Unless, therefore, the reflected sound has traveled 110 feet further than the direct sound, it will cause no confusion to the hearer. Whether it will prove objectionable depends also upon its intensity, when it does reach him. The intensity decreases with increase of distance, and also with the number of reflections the sound has undergone. But, if the rate of speaking is less than ten syllables to a second, which may be taken as a maximum, then the difference of distances for a direct and a reflected sound must be more than 110 feet, for interference. In a forward and back line of transmission, the hall would have to be 55 feet long to produce an echo, and if the rate of speaking were so deliberate as to permit one-fifth of a second interval between articulate sounds, no interference by reason of an echo from the front or back would occur, unless the hall were at least 110 feet long. In the five instances here presented, the lengths ranged from 70 feet to 102 feet, and in each it was possible to produce confusion by an echo, but the echo was subject to modifying influences that in several instances could be clearly recognized. A hearer may be so placed that the direct sound is greatly obstructed while the reflected has a clear pathway, and so may be the stronger. This was especially noticeable in room No. 3, at the positions numbered 28 and 29.

The key to which a hall readily resounds, by reason of its size and proportions, is the pitch at which the sound of least intensity can be heard throughout the room. It is also just the tone in which the echo is likely to be annoying. Hence it is in this tone that the orator has least propriety in speaking loudly. Thus in the room No. 4, which was nearly square, and with a flat ceiling broken in surface by girders running both longitudinally and transversely, the echo became perceptible only with words nearly in the keynote of the church. It was noticeable that in each auditorium, with a congregation present, the prevailing note of the speaker's voice was from a half to a whole tone lower than the resonance key of the room when empty.

In room No. 4, the galleries extending along each side and across the end, with their columns and rising tiers of occupants, together with the organ behind the speaker, destroy the forms of the sound waves, both incident and reflected, and defeat the echo. In No. 5, the organ, with its corrugated front, and gallery at the entrance, and the forest of columns about the pulpit at the end of the hall accomplish the same for the medial portion, and the pendent lamps probably assist laterally. A placing of the organ in Nos. 1 and 2 as in No. 4 is doubtless beneficial. In No. 3 there is nothing but one chandelier to do good, while the speaker has an elastic glass partition behind him to heighten instead of defeat the second reflection.

Plainly, little generalization is possible from so few instances. So far as they do show anything in common, we might say that a position near a wall is likely to be a better place for hearing than the center of the room; that in all the instances here presented, the place occupied by the preacher was superior for hearing sounds throughout the room to nearly every place in the room for listening to sounds from the pulpit. Also, that any arrangement of ceiling or wall that tends to focus the sounds by reflection excites thereby inequalities in the acoustic merits of the auditorium. Such are especially spherical domes, and arched ceilings *across* the room. This was exemplified in No. 2, No. 3 and No. 5.

TRUMPET AT P.

Distance.	Listener.	Press.	Difference.
0	At hand.	10 mm.	0
15′	1	14	4
15′	2	12	2
15′	14	14	4
15′	15	13	3
30′	3	14	4
30′	4	13	3
30′	5	13	3
30′	16	13	3
30′	17	14	4
30′	18	16	6
45′	6	14	4
45′	7	12	2
45′	8	13	3
45′	19	16	6
45′	20	15	5
45′	21	13	3
60′	9	14	4
60′	10	14	4
60′	11	14	4
60′	22	15	5
60′	23	14·5	4·5
60′	24	14	4
75′	12	13	3
75′	13	13	3
75′	25	14	4
75′	26	14	4
13′	27	12	2

TESTS ON ROOM NO. 3.

REVERSE SERIES, LISTENER AT P.

Distance.	Trumpet.	Press.	Difference.
0	At hand.	10 mm.	0
30′	3-16	14	4
30′	5	12	2
30′	18	12	2
45′	6-19	13	3
45′	7-8	13	3
45′	21	13	3
60′	9-22	13	3
60′	11	14	4
60′	24	12	2
75′	12-25	13	3
75′	13	13	3
75′	26	12	2
13′	27	11	1

*Abstract of a paper read before the Department of Physics in the Brooklyn Institute, January 29, 1891. By Prof. D. W. Hering.

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RECENTLY PATENTED INVENTIONS.

Engineering.

FEED WATER HEATER. — Loveatus Norton, Escanaba, Mich. This invention is designed to utilize the exhaust steam of locomotives to heat the water before it enters the boiler, there being provided for this purpose in advance of the smoke chamber a supplemental chamber with the bottom of which the exhaust communicates, the feed water pipe being extended through and having a coil located in the supplemental chamber.

ROD PACKING. — James Walker, London, England. This is a packing formed of metal and asbestos or other fibrous strands, interwoven into a sheet and folded bellows-like into layers, with metallic pins embedded in the packing and exposed on its working face, the folds to open to the steam, making a packing of great elasticity, designed to resist the heat of high pressure steam in triple expansion engines.

HYDRAULIC PRESS PUMPING ENGINE GOVERNING GEAR.—Charles Davy, Sheffield, England. Two patents have been granted this inventor, covering improvements on a former patented invention of the same inventor, for controlling the speed of the engines of a press for forging or other purposes where the water is pumped against a variable resistance, there being combined with the steam regulating valve a plunger acted on by the hydraulic pressure opposed to the engines and opposed by a spring, a hand lever being pivoted to the plunger and connected to the valve, with an adjustable stop, or connected to the valve and working in a slot in the plunger, whereby the movement of the valve beyond a certain point is dependent on the position of the plunger and the movement of the lever, while the valve may be closed independently of the position of the plunger.

Electrical.

TELEGRAPH TRANSMITTER. — Samuel W. Smith, New York City. This device has a revoluble shaft carrying sending mechanism, with means for closing the circuit through the shaft pinion and sending mechanism, and other novel features, affording a separate transmitter for each letter, so that a key may be operated to send one letter before the movement of a preceding key is completed, thus facilitating the rapid sending of messages.

ANNUNCIATOR AND INDICATOR.—John E. A. Miller, San Francisco, Cal. The mechanism between the indicating devices and the annunciator bell and battery, provided by this invention, is such that the closing of the external or main signal circuit will operate to close the short annunciator circuit and cause the bell to sound until the short circuit is broken.

Railway Appliances.

CAR COUPLING.—Chauncey W. Smith, Brush Creek, Iowa. The drawhead of this device has an offset with a beveled hood in which a lift arm is pivoted having a recess in which the coupling pin is pivoted, in connection with a spring and means of releasing the pin, the coupling being automatic, while uncoupling is effected from the top or side of the car, and the improved coupler being adapted for use with the old style of link coupler.

CAR COUPLING.—Francis A. Johnson, Powhatan, Ark. The drawhead of this coupling has transversely sliding spring-pressed plates in connection with vertically reciprocating bars and a rocking lever, to control the engagement of an arrow-headed coupling link by the plates, the device being simple in construction, and adapted to couple cars of varying heights without requiring the operator to step between the cars.

RAILWAY AXLE BOX. — Louis Ellert, New York City. Combined with a box shell with a tapered recess across its inner end is a leather packing joint apertured to fit tightly on the journal, and split to receive a wedge from below, making an improved metallic bearing with lubricating device, and method of sealing the aperture when the journal end of the axle penetrates the box.

RAIL BRAKE. — Albert M. Perry, Richmond, Va. This is an inexpensive and easily applied device, with which the wear will be upon the rail instead of upon the wheel, the invention consisting of an arm carrying a brake shoe at its outer end, the arm being fulcrumed loosely on the car axle, and its raising and lowering being controlled from the ordinary brake mechanism.

RAILROAD FROG. — Mason A Dudley, Buffalo Forge, Va. This invention relates particularly to a spring frog designed to be safe at all times, whether all the parts are in proper working order or not, and provides a fixed wing rail beneath which is a sliding plate carrying a movable wing rail, the plate being adapted to be sprung outwardly when the wheel passes.

CAR TRANSOM LIFTER. — John L. Baker, Greensborough, N. C. Combined with a series of pivoted ventilating windows are horizontal shifting bars with chains or cords connecting the bars and the window bolts, and other novel features, whereby all the windows on both sides of the clear story of a railway coach may be simultaneously opened or closed.

ELEVATED RAILROAD. — David B. Weaver, Hopewell, Pa. This invention covers a plan for an electric, cable, elevated road, in which the operator starts a motor rotating a drum to wind up part of the cable to propel the car, the invention covering novel details and combinations of parts designed to afford means of rapid transit at a low cost.

Mechanical.

DECORTICATING MACHINE. — Jose Garcia Hernandez, Havana, Cuba. Combined with reciprocating double knives is a fixed and a movable presser bar, and intermittent feed rollers arranged after a novel plan, with other distinctive features, the machine being designed to break ramie, jute, hemp, and other fibrous plants, cleaning the fiber of woody matter and rendering it smooth.

FILE CUTTING MACHINE. — Julius Erlenwein, Edenkoben, Germany. Combined with an automatic feeding mechanism is a device for holding a cutter, a mechanism to intensify the blow, a screw gear which operates the automatic cutting mechanism, and causes the cuts to be wider in the center, in connection with a table and carriage which operate automatically, and enable the serrations in the files to be cut at any desired angle.

MIDDLINGS PURIFIER AND DUST COLLECTOR.—Ferdinand C. Miller and John H. Walker, Oregon City, Oregon. This invention covers novel details and combinations of parts in a machine designed to effectively purify and grade middlings, and at the same time collect all separated dust and other impurities, the middlings not being subjected to any harsh treatment so as to become floured or broken.

LUMBER DRESSING MACHINE.—Robert L. Patterson, Wellington, Kansas. This machine has a wheeled frame with a vertical shaft carrying a dressing head, in connection with a clamping frame and longitudinal track, for dressing floors or the surface of lumber, the faces and edges of the wood being conveniently and effectively dressed with knives or with sandpaper or emery, the dressing head being revolved by operating a crank.

BORING MACHINE.—George L. Campbell, Williamsport, Pa. This is a machine specially designed for conveniently boring holes in joists of a ceiling or floor for the passage of concealed electric wires, being a hand implement in which is a boring bit and operating mechanism mounted in an open two-part frame.

BORING AND MORTISING MACHINE.—William C. and John A. Aycock, Griffin, Ga. This is an improvement on a former patented invention of the same inventors for a blind stile boring machine, with which a mortising machine is so combined as to rapidly and automatically bore the apertures and make the mortises at the same time, a rotary boring bit passing through a reciprocating non-rotary hollow mortising tool, with means for independently reciprocating the bit.

BRICK KILN. — John B. Griswold, Zanesville, Ohio. This invention covers an improvement on a former patented invention of the same inventor, the kiln being designed to effect a thorough combustion of the fuel and gases, and the arrangement being such that the products of combustion enter at the top or bottom, while alternate direct or indirect draughts may be used, and the heat can be quickly directed to any part of the kiln, and cut off at other parts, or sent through the kiln at different angles.

CALCINING CEMENT. — Paul Krottnaurer, White Hall, Pa. This invention provides an improved kiln for the continuous burning of cement or lime, designed to economize fuel, prevent slagging adhesion of material on the wall of the combustion chamber, and utilize escaping heat to generate steam employed in the burning process and for general uses.

SAND SCREEN.—Charles Prescott and Moses H. Bennett, Fairmount, Neb. The frame of this screen has a circular opening in its front through which projects a double angle bracket forming one of the bearings of a shaft carrying a rotary screen revolved by a crank arm, whereby fine sand may be quickly separated from coarser materials, gravel, etc.

Agricultural.

PLOW AND FERTILIZER DISTRIBUTER.—William F. Moss, Fitzpatrick's, Ala. This is a combination machine in which the hopper box is self-adjusting for height on the plow, and a distributer roller is revolved as the plow moves forward, spring plates in the hopper box contacting with grooves in the roller, whereby the fertilizer is distributed as a growing crop is cultivated, or a powdered fertilizing compound may be thoroughly mixed with the soil.

POWDER DISTRIBUTER. — Merritt C. Barden, West Pawlet, Vt. This is a device to be carried by hand, consisting of a cylindrical receiver with central bottom aperture, below which is retained a pan with suitable holes in its bottom, the receiver delivering the powder on the screen-like bottom of the pan, from which it is sifted by agitating the pan.

BUTTER WORKER. — Thomas Muir, Margaretville, N. Y. This invention covers an improvement on a former patented invention of the same inventor for a butter worker which is simple and durable in construction and not liable to get out of order by warping, leakage or other causes, the invention covering various novel details and combinations of parts.

Miscellaneous.

CALENDAR.—James D. Watters, Belair, Md. This is an improved universal calendar composed of three sections, the second turning within the first, and the third within the second, the first section having the dominical letters, with the names of the months arranged in relation thereto, a movable disk registering therewith the days of the week, and another movable disk registering the days of the month with the days of the week.

TWINE REEL.—John B. Holmes, New York City. This invention provides a frame with swinging arms to support a spool or ball of twine in such way as to readily give off only the desired amount of twine required at a time, a retainer preventing further unwinding and tangling.

BOOT OR SHOE CASE. — Simon F. Frazier, Quenemo, Kansas. This case has a series of guides or strips centrally pivoted, with an adjustable partition held in side pieces, the invention being designed to afford a neat and inexpensive case which will hold the boots in place against falling when one or more pairs have been removed, without increasing the size of the box.

STRAP AND BUCKLE SHIELD.—George H. Nicholls, Galveston, Texas. This shield is made of a flat elongated plate with a slot near its center, two pairs of limbs from the side edges of the plate being adapted to loosely clasp a strap, the shield being readily adjustable, and designed to prevent the ordinary wear on a strap resulting from the action of the buckle.

STOVE PIPE FASTENER. — Frank A. Snow, David City, Neb. This is a clamp for use at the chimney flue, and capable of longitudinal adjustment, so that the device may be applied to walls of different thicknesses, to receive the pipe in position, the same size fastener being applicable to stove or furnace pipes of different sizes, and no special tools being needed.

BRACKET BED. — Thomas E. Smith, New Castle, Pa. This is a device by which a crib may be readily attached to or detached from a regular bedstead, the crib having transverse spring bars adapted to pass through bearings on the bedstead, and a longitudinal bearing adjustably secured to the free ends of the spring bars, the crib being permitted to swing up and down freely.

CARRIER AND CLEANER. — Jacob H. R. Wendel, Harrisburg, Pa. This invention consists of a shaft mounted to turn in a handle, and carrying a brush and adjustable arms, by which cuspidores and similar articles may be conveniently carried from place to place and cleaned by the brush without soiling the hands or clothes.

TOY. — Sadie F. Simpson, Saxonville, Mass. This device consists of separated teething rings, of rubber, ivory, or other suitable material, a hollow handle uniting the rings, and there being a rattling device within the handle.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

TRIPLE EXPANSION ENGINES AND ENGINE TRIALS. By Professor Osborne Reynolds. New York: D. Van Nostrand Company. 1890. Pp. iv, 191. Price 50 cents.

This little work of the Van Nostrand Science Series gives the results of tests with special engines at the Owens College, Massachusetts, laboratory. While the engines were built for work, they were also especially designed to facilitate tests by the students and professors of the college. The results of such tests are written here, with a discussion on the same when the paper was read before the engineering society.

A DESCRIPTIVE TREATISE ON CONSTRUCTIVE STEAM ENGINEERING, EMBRACING ENGINES, PUMPS, AND BOILERS By Jay M. Whitham. New York: John Wiley & Sons. 1891. Pp. vi, 900. Price $10.

The title of this book sufficiently tells its scope, which is the constructive features of steam engineering as regards engines and boilers, with their accessories and appendages. The various types of engines are classified, and the subjects of heat and steam with thermometers and calorimeters are discussed, and the subject of design occupies most of the rest of the book. The work is profusely illustrated with cuts showing actual practice of all of the best firms of engine makers, boiler manufacturers and others, while the diagrams of indicators, tables of constants, etc., add largely to the theoretical value of the book.

THOMAS JEFFERSON'S VIEWS ON PUBLIC EDUCATION. By John C. Henderson. New York and London: G. P. Putnam's Sons. 1890. Pp. viii, 387. Price $1.75.

The thoughts of the founder of the United States government upon the necessity of education for the people, as here presented, are of unusual value at the present time, when so much attention and discussion is lavished upon educational subjects. The present work is principally made up of extracts from Thomas Jefferson's writings and his views on the imperative necessity of education for youth. A chapter is devoted to "Our Colored Brethren," which, of course, applies to modern times and is only indirectly referred to Jefferson's theories. Finally, a Jeffersonian amendment to the constitution is proposed and enlarged upon in a special chapter.

TRANSACTIONS OF THE KANSAS STATE HISTORICAL SOCIETY, EMBRACING THE FIFTH AND SIXTH BIENNIAL REPORTS, 1886–1888. Vol. iv. Topeka. 1890. Pp. 819.

A great portion of the most stirring period of Kansas history is included in this volume of Transactions of the Kansas Historical Society, which is largely devoted to the reproduction of the official correspondence pertaining to the office of governor of Kansas Territory in 1856 and 1857. It is a very valuable contribution to recent American history and will be welcomed by many students of this department, in which the students are becoming more numerous every year. The alphabetical index of 60 pages, containing almost every name in the entire volume, as well as the subjects, is a great addition.

A SHORT COURSE OF EXPERIMENTS IN PHYSICAL MEASUREMENT. By Harold Whiting. In four parts. Part II. Sound, Dynamics, Magnetism and Electricity. Cambridge: John Wilson & Son. 1891. Pp. vii, 583.

The physics of to-day is really the "science of measurement," a term originally applied to electricity only. The present work is an excellent contribution to the "science of measurement" in sound, dynamics, magnetism, and electricity. It is a continuation, and forms the second part of a treatise on the measurements of physics, and it is designed for experimental work. All the apparatus and experiments shown are such as are peculiarly suited for work in what has been termed the new physics.

WAR AND THE WEATHER. By Edward Powers. Delavan, Wis. 1890. Pp. 202. Price $1.

A theory has long been held that cannonading produces rain. In "War and Weather" the subject is reviewed, with many opinions from different military authorities as to the water supply of the country, with suggestions as to the production of rainfall artificially for the fertilization of large areas of the country.

INCANDESCENT ELECTRIC LIGHTING. A practical description of the Edison system. By L. H. Latimer. To which is added the design and operation of incandescent stations. By G. J. Field. And a paper on the maximum efficiency of incandescent lamps. By John W. Howell. New York: D. Van Nostrand Company. 1890. Pp. 140. Price 50 cents.

The Edison system has now become recognized as the leading low tension lighting system of this country. The present work, treating of the general condition of the system and the manufacture and efficiency of incandescent lamps, is an extremely interesting contribution to the subject and, we have no doubt, will be appreciated by a large clientage. The book is fully illustrated by engravings and diagrams relating to the subject.

The Campbell & Zell Company, of Baltimore, Md., have just issued a handsomely illustrated catalogue of the Zell improved water tube boiler, which has an established record as a safe, economical, and efficient steam producer. A contract has recently been awarded the company for a 600 horse power boiler for the Metropolitan Railroad Co., of Washington, D. C.

The special machinery and machine tools made by the Dwight Slate Machine Co., of Hartford, Conn., are described in a neat illustrated catalogue issued by the company. Many kinds of drills are shown, fine engine and bench lathes, cutter and reamer grinders, plain and nut milling machines, screw slotting machines, marking machines, cut-off tools, chucks, etc., all of a standard excellence in quality of material used and accuracy of workmanship.

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TABLE OF CONTENTS.

1. Plate in colors showing the residence of P. H. Hodges, at Stratford, Conn. Perspective view, floor plans, etc. Cost complete $8,000.
2. Handsome colored plate of an elegant residence in Riverside Park, New York City. Floor plans, perspective elevation, etc. Cost $30,000.
3. Residence at Bridgeport, Conn. Perspective view, floor plans, etc. Cost about $7,000.
4. Handsome residence of Mr. F. Chamberlain, at Hartford, Conn. Francis H. Kimball, of New York City, architect. Floor plans, perspective elevation, etc. Cost $60,000 complete.
5. Illustrations of two attractive semi-detached houses erected for Mr. A. L. Pennock, at Philadelphia, Pa. Floor plans and perspective. Approximate cost $15,000 each. F. U. Beal, New York, architect.
6. Floor plans and photographic view of a residence at Edgecombe Court, Chicago, Ill. Estimated cost $5,400.
7. A pillar cottage erected for Mr. G. W. Childs, at Wayne, Pa. Cost $6,000 complete. Perspective and floor plans.
8. Handsome residence at Hartford, Conn., W. B. Tubbey, architect, New York. Cost $19,000 complete. Floor plans and perspective.
9. Two floor plans and photographic view of an attractive residence at Austin, Chicago, Ill. Estimated cost $7,000.
10. A very convenient and attractive suburban cottage of modern design, erected for Mr. E. W. Given, at Mont Rose, Orange, N. J. Cost $5,500 complete. Messrs. Rossiter & Wright, architects, New York. Floor plans and perspective.
11. Residence at Alexander Avenue, Buena Park, Chicago. Estimated cost $5,000 complete. Plans and photographic view.
12. Photographic perspective view of the residence of Mr. Frank Crowell, Minneapolis, Minn. F. E. Joralemon, architect.
13. Miscellaneous contents: Preserving smoke pipes from rust.—Door hanging, illustrated with 6 figures.—Safe construction of buildings, illustrated with 5 figures.—Improved blind slat planing machine, illustrated.—Seamless copper house boiler, illustrated.—Best quality of roofing tin plate.—Blower engines of the Galena.—An efficient sandpapering machine, illustrated.—The "Hero" spring hinge, illustrated.—The Duplex joist hanger.

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Business and Personal.

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Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

The Dwight Slate Machine Co., of Hartford, Conn., make the most extensive line of hand, foot, and automatic feed drills for light work, ½ in. holes and less. 1891 catalogue free.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2879) R. L. N. writes: 1. I have a very fine meerschaum pipe that has become bruised and scratched; how can I repolish it? A. For your meerschaum apply ordinary polishing processes, sand paper of progressive fineness, and fine crocus or rotten-stone eventually. 2. I have also an old violin that I would like to scrape and restain and varnish. What is the stain that puts such a rich color on violins? A. For staining a violin red dragon's blood may be used or red sanders wood. For yellow, aloes, annatto, gamboge, turmeric or saffron, dissolve in alcohol, filtering if necessary, and apply. The reds and yellows are to be mixed to suit the taste. There are many formulas for varnishes. One is fused amber 2 ounces, turpentine 5 ounces, drying linseed oil 5 ounces; dissolve by heat. For spirit varnish the following is a representative formula: Mastic and sandarac, of each 1 drachm, lac 6½ drachms, alcohol 5 fl. oz. It is no easy matter to varnish a violin successfully. Some makers apply no stain, but use colored varnish. The above colors may be used in the spirit varnish. A large number of coats are given and each coat is rubbed down with ground pumice and water or with fine sand paper.

(2880) C. A. A. says: I noticed a query in the issue of November 8, 1890, page 299, query 2558, a statement that a boat 25 or 30 feet long would not go much more than 10 miles an hour. 1. Why will not a boat of that size go 16 knots an hour as well as a 5,000 ton steamer, with the same propeller of horse power? A. Small boats as well as large ones have their propelling power proportioned to the use that the boat is made for. If carrying capacity is sacrificed, great speed may be obtained. 2. Will not the same sized boat go faster with side wheels than with a propeller with the same horse power? A. There is but little difference between side wheels and propellers in still water. There is no reason why small boats should make as high speed as large ones. The conditions of resistance and power are not the same. A small boat cannot carry as great power in proportion to tonnage, with best lines for speed, as large ones.

(2881) E. S. L. asks whether tallow can be deodorized, and whether, by doing so, the lubricating qualities of the tallow would be preserved or lost? A. See query 2878. The lubricating qualities would remain, but the traces of acid it would retain might do much harm.

(2882) W. F. W. says: I have a six-cell plunge battery, capacity of each cell 80 cubic inches, size of zinc plates 3x5 inches, five-sixteenths inch thick, one zinc and two carbons in each cell. 1. What is its voltage? A. At the start about 12 volts, rapidly running down to 6 or 8 volts. 2. What candle power lamp, and of what voltage will it run most successfully for one hour, for two hours, for three hours? A. Use an 8 volt lamp. 3. Will the light fail much at the end of times mentioned? A. Yes; it will run down rapidly. 4. What are the latest opinions of the best authorities regarding the value of Dr. Koch's consumption cure? A. We refer you to our columns for several accounts. On the whole, opinions are favorable. 5. Is consumption contagious? A. Probably not. 6. Some time ago you gave a receipt for making a baking powder of bitartrate of potash and bicarbonate of soda. It is an excellent powder and stronger than any I can buy, but upon standing it becomes lumpy. Shall I add flour? A. Use more flour and mix more thoroughly and keep dry. 7. Where powders are manufactured for the trade what methods are used for mixing the ingredients? A. Sifting machines are excellent mixers, and need not cost very much. Your other queries we cannot undertake to answer. For information on consumption, its contagiousness and cure, we refer you to our SUPPLEMENT, Nos. 338, 242, 243, 77, 297, and many others.

(2883) H. C. P. says: Will you please inform me through your columns the life of different woods used for railroad ties? The life of rails? A. The life of ties and rails depends entirely upon the amount and weight of traffic. Of uncreosoted woods, chestnut lasts the longest, 5 to 14 years, white oak 5 to 10, spruce 4 to 7 years, hemlock 4 to 8 years. Steel rails last from 9 to 25 years; iron rails are nearly out of use.

(2884) J. R. & J. B. ask: 1. Why is a ship built and launched stern first? Is there not a scientific problem attached? A. Because the fullness of the stern prevents the shipping of water. 2. What is the best rust preventive for blued steel? A. Thin mastic or shellac varnish.

(2885) G. F. D. says: I have a quantity of electrotype metal that I wish to use to back up curved electro shells in casting box, but I find it too thick and sluggish to run well and fill out the mould. Can you inform me if a mixture of tin with it will make it more fluid, and if so, in what proportion should it be used? Is there any other metal equally effective? A. Our electrotyper says when he uses the old metal he adds for each 100 pounds of it 4 pounds of tin and 3 pounds of antimony, and finds the metal then flows nicely. It would, he says, make still better plates if 25 pounds new metal were added.

(2886) H. R. C. asks: What is a good transparent cement for microscopical purposes? A. The following is highly recommended:

Gum dammar	5 drachms.
Gum mastic	3 "
Dried Canada balsam	3 "
Chloroform	1 fl. oz.
Spirits of turpentine	1 " "

Dissolve by shaking, then filter through filter paper.

(2887) C. E. R. asks: Would you please inform me what will give black ink a good gloss without making it sticky? A. Gum arabic.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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March 3, 1891.

AND EACH BEARING THAT DATE.

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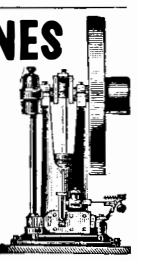

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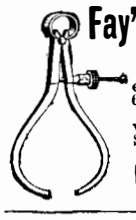

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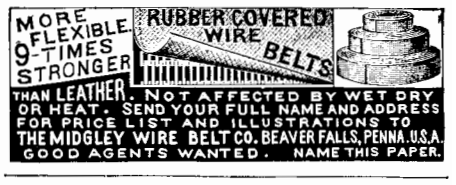
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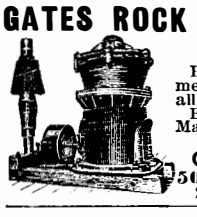

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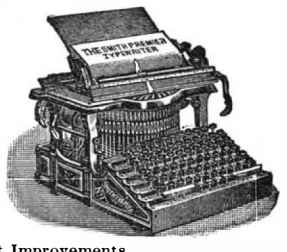

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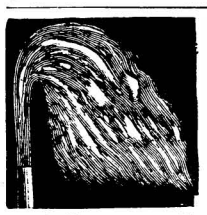

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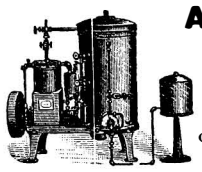

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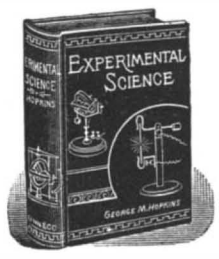

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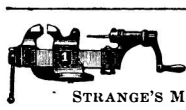

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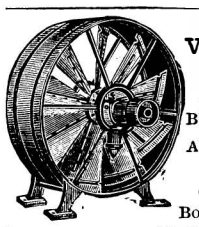

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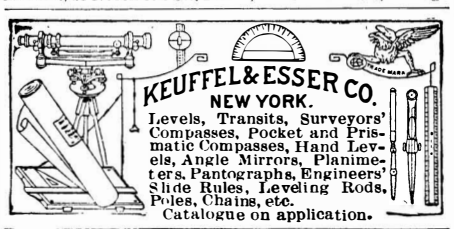

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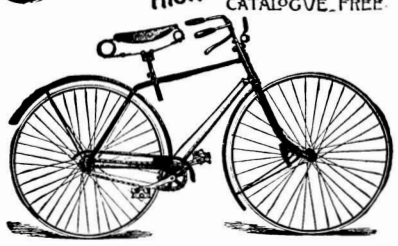

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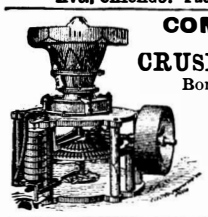

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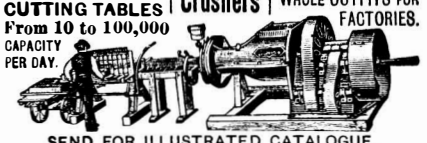

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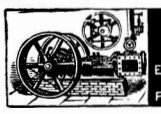

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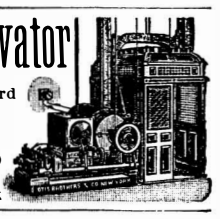

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